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EDITORIAL.

The New Consolidated Index to Engineering News.

We have the pleasure of announcing that the Index to the ten volumes of Engineering News, from Jan. 1, 1905, to Dec. 31, 1909, is now in the printers' hands, and will be ready for delivery in May. The value of this Index as a labor-saving tool to anyone looking up a subject in the back volumes of Engineering News during this five-year period is so great that no file of the volumes covering these years, or any part of them, can be considered complete without this Index. The book gives in one place references to all the articles published on a given subject during these five years. To find these references without the book, it is necessary to consult the indexes in each one of the ten different volumes.

With the growth of Engineering News and the increasing range of the subjects treated in its pages, the size of the new index has necessarily been increased over the volume covering the preceding five-year period. The Index to Engineering News from 1900 to the end of 1904 is a volume of 290 pages. The Index to Engineering News from 1905 to the end of 1909 will probably have nearly 400 pages. In its compilation some new features have been introduced. The character and length of the articles are indicated, so that the searcher can select at a glance the most important articles on a given subject and turn to them at once.

With the lapse of years, the use of the files of Engineering News for reference has greatly increased. This is partially due, we believe, to the facility with which they may be consulted by the aid of the book indexes which we have published. As many of our readers will recall, the forthcoming volume will be the fourth in our series of book indexes, which now cover the entire set of Engineering News volumes, from Volume 1, published in 1874, to Volume 62, July-December, 1909. All these indexes are still in print. We know of no other engineering journal in the world which has made the entire contents from its establishment available for reference in this way.

CORRESPONDENCE.

The Author of "Energy" on the Review and Reviewer of His Book.

Sir: I thank you for the review of my book "Energy" appearing in your issue of Feb. 17. While adverse, it is fair. The reviewer confesses frankly that he does not understand the book. The writer, having suffered recently from a reviewer in a prominent journal who was laboring under the same difficulty, but who was less frank about it, can appreciate this favor.

Since the language of the review is more controversial than reportorial, I may venture some argument in reply.

The first two chapters of the book were designed to form an incontrovertible foundation for later argument, by confining themselves strictly to the true mathematical statement of the Newtonian mechanics, explained in simple language. The proofs of this entire portion of the book were submitted to an authority in mathematical and celestial mechanics, before release to the printer. As only minor errors were detected in what I had deemed correct mechanics before submission to this criticism, it may be accepted that these first chapters are, in all probability, correct. I beg to take broad exception to your reviewer's statement that this foundation for the book is wrong. I also take exception to his being allowed to make such a statement, without his accompanying it with a commensurate attempt to show what should be substituted for it, as correct.

The truth of the matter is that this entire foundation—to say nothing of the superstructure erected thereon in the later chapters—is located quite above your reviewer's head. It never touched him, nor he it. I know of no better advertisement of the great need for this book than the way in which a reader of his intelligence persists in fundamentally erroneous mechanics. He still believes the ordinary approximate equations of applied engineering to be true, and to be those of straight-line motion, when two chapters have just been devoted, before his eye, to pointing out that Newtonian mechanics comprises no equations for the action of a single particle, and is based upon the observation in nature of curvilinear motion only.

That is to say, if anyone ever observed straight-line motion in nature, and reduced it to a mathematical basis, it was neither Kepler nor Newton nor La Place. I have no evidence that anyone ever saw any such a thing. I do not think that such a thing exists, to be observed.

Confronted with these facts, your reviewer retreats, unmoved, to what he calls "the center of gravity of the entire universe." My language having called attention to the absurdity of any attempted idea of *absolute* motion, distance, force or energy—all these being relative only, occurring only *between* mass-portions, not in them—he refers to this center as his support in his doctrine of absolutism.

Pray, just where is this "center of the entire universe?" It has now been long established, as a conclusion of modern science, not only that there is no scientific evidence of any limits or boundaries to the physical universe, but that the human intellect would be quite incapable of observing or comprehending it if there were. Therefore this center-of-universal-gravity idea—which necessarily implies the existence of such finite limits—brings metaphysics into engineering science with a vengeance.

I have felt a bit apologetic myself, I must confess, for calling attention, for thermodynamic purposes, to the fact that every cannon-ball possesses not only one energy-fund relatively to the earth, as of interest to the artillerist, but also another relatively to the moon, another to the sun, another to Mars, etc. Between each mass-portion and every other in the universe exists a fund of relative distance, relative motion and of related force. These together make up its fund of energy. Hence energy is purely a matter of relativity. Each body possesses as many funds of force, motion, distance and energy as there are other mass-portions in the universe. But all of these terms become meaningless when attached to the idea of a *single* mass-portion, in order to reduce them to an absolute basis. Newton's unshaken statements of the elements of mechanics: "No action *without reaction*" and "gravitational and centrifugal forces are proportional to the *product of the masses involved*," have no meaning at all except when understood in terms of at least two mass-portions.

I have felt, as I said, that an explanation was needed for presenting to the student facts so remote from daily engineering as these various celestial energetic relationships—which are yet so trite to the student of celestial mechanics. Yet here is your reviewer going much farther—wishing the student to base his ideas upon not only these remote, though mathematically definite, energy-funds, but upon another vastly more remote—upon one absolutely unknown, unmeasurable and incomprehensible by man, the center of gravity of the entire universe! Having objected to my statement that there are as many funds of distance, force, motion and energy for each mass-portion as it possesses relationships with other mass-portions, he wishes to substitute therefor what could only be regarded, were it comprehensible, as the *summation* of the infinite number of such relationships! And then what he does do is to use the erroneous equations which merely approximate a correct statement of a single one of these relationships—that with the earth—as the only correct equations for this infinitely complex summation!

That the formulas current in engineering practice are quite adequate for their purpose is nowhere denied in the book. Indeed, the reader is frequently reminded that it is this very adequacy which has led to the wide neglect of correct mechanics in engineering education, and its relegation to the astronomers. If it were not for the increasing impossibility of understanding thermodynamics without correct elementary mechanics, the two professions would probably have continued indefinitely, each in its own exclusive path: the astronomers dealing in the true mechanics of relativity, while the engineers persisted in their devotion to the false, but convenient, doctrine of absolutism.

But your reviewer's position, even if correct, is not fair. Since the true Newtonian mechanics of relativity give a ready explanation of all familiar problems in thermal mechanics, what has he to offer as its counterpart, if he is to insist upon his absolute foundation for mechanics? What, for instance, is his doctrine as to the constitution and thermodynamic vigor of water, or steam? I have no doubt that he denies their homogeneity. He does not hesitate, I will wager, to teach that they are composed of many component particles, separated into relationships of space, motion, force and energy, and that this "internal" energy is what drives our engines.

But what, accepting his dogma of absolutism, is the student to get from this? He is forbidden to turn to the heavens, as Newton did, to draw ideas from the relativity between the planets. He must confine himself to the equations of absolute, straight-line motion and energy, as taught in undergraduate mechanics. But the student's only experience with "particles" is with something like billiard-balls. Well, a carload of billiard-balls, dumped out, would act somewhat like water, it is true. But its action is so far from like that of water that it is much more useful—and is scientifically exact—as an illustration of viscosity and entropic unavailability of energy, than it is of fluidity and vigor of expansivity.

It is only as the swarm of billiard-balls might imaginably be removed from the influence of the earth, with no motion, position, force or energy in any one ball except *relatively* to its neighbors, that it can simulate fluidity, internal energy or expansivity. For these attributes are manifested by water and steam independently of every other mass-portion in the universe. What can any attempted idea of the "center of the universe" possibly have to do with the tremendous energy embodied in a cubic foot of steam?

Your reviewer gets no further in the comprehension of my book than to suppose that my coined words: "thermogy" and "labority," as he says, "mean heat-transfer and heat-transformation" respectively. This, also, is encouraging. The book points out that no two authorities agree as to any definition of "heat"—Mr. James Swinburne, at the close of the famous London discussion of entropy in 1902-3, pointed out that the reason why it got nowhere was the lack of any definition of heat—and that the term "heat-transfer" is applied to three quite dissimilar processes, the isomorphic, the isothermal and the isenergic. At the same time, there are several other, and still more dissimilar, processes which produce results identical with those of "heat-transfer." Since the book shows that the mere application of true Newtonian mechanics reduces this entire complex and inconsistent mess of words to various combinations of only *two basic thermal processes*—the isothermal and adiabatic—while identifying them with the *two basic mechanical processes* of mechanical energetics, it does seem as if I might have been thanked, rather than ridiculed, for pointing this out. The continued reference of thermodynamic matters to these two basic processes, over several chapters, might make the reader grateful that I had coined two new single words, each to replace a long and awkward phrase. But it didn't. The reviewer did not even regard the performance as of sufficient importance to inform his readers

that it had been done—which seems to me the first and peculiar duty devolving upon a reviewer.

Finally, your reviewer refers to the book frequently as a "speculation." It is not a speculation at all, except in its closing paragraphs. The doctrine that heat is a mode of motion may still be regarded as a speculation, it is true; but this the book neither affirms nor denies. All that it attempts is to point out *what* mode of motion, if we are to insist upon the identity between heat and work, is alone consistent with the Newtonian mechanics, as constituting thermal energy. The book is a mathematically accurate deduction from work which has stood the test from the seventeenth to the twentieth centuries, and no speculation at all.

Yours very truly,

Sidney A. Reeve.

469 Edgewood Ave., New Haven, Conn., March 1, 1910.

On the Review of "The Modern Gas-Engine and Gas-Producer."

Sir: In the review by Prof. Lionel S. Marks, of "The Modern Gas-Engine and the Gas-Producer," published in your issue of Feb. 17, 1910, there occurs a statement by which it becomes evident that the reviewer has misconstrued the object of the derivation of a formula for the engine capacity, based on the heat value of the fuel. This statement having bearing on a rather vital phase of the subject, which often is overlooked until contact with some practical problem will necessitate its recognition, I may be allowed to make some comments with regard to it. Referring to the method used for deriving the formula, the reviewer says:

> This method of attacking the gas-engine theory is not convincing; it is based on a number of assumptions which in turn have as their justification the results of gas-engine experience or tests. It is more straightforward and is less misleading to use as a basis for gas-engine design the diagram factors, mean effective pressures, and efficiences that have been found by tests on existing engines.

The present writer believes, of course, that the mean effective pressure, if it is known, is the most convenient as a basis for the design of an engine; and on page 56 of the book it is stated that it is usual to proportion the cylinder to an assumed mean pressure, and the method is given. However, in theory it is thinkable, and in practice it has been found very likely, that some person shall come along with a sample-can of gas and ask for an engine that will give a stated power on that gas. The contents of the can may be some unusually rich or unusually poor natural gas or coke-oven gas, or perhaps gas retorted from offal from some industrial establishment. In any case, it will be out of the question to turn around and ask the person supplying the sample to state what mean effective pressure the gas will produce in the cylinder. This must be estimated, with the analysis of the fuel as a basis.

Pages 111 to 120 of the book deal with the problem of determining the mean effective pressure, or, more directly, the suction displacement required per horsepower, from the fuel-analysis; and the attempt has, of course, been made to take into consideration as many as possible of the factors that have an influence on the density of the charge at the end of the suction stroke. Sample calculations have been carried out for a number of known gas-engine fuels (and this is probably why the reviewer came to the conclusions he did), more for the sake of illustrating how closely the calculated results will agree with the results obtained from tests than for any necessity of determining by means of them the mean effective pressure any known gas will give.

Of the factors required for the estimate of the capacity of an engine on a fuel of known heat value and composition we know all, if we know our engine; excepting, perhaps, the extent to which the density of the charge will be reduced during the admission stroke. This factor may need to be investigated; but any rough estimate of it ought to be safer than a guess at the mean effective pressure, about which nothing at all may be known.

With regard to a purely academic question, it is not evident why it should be misleading to mention the fact that the internal heat of a substance is a function of the pressure and volume of the substance. The substances with which the subject most nearly is concerned are gases, and the stated fact is liable to confront us every day in practice, because the energy stored in steam, for instance, is measured not generally in degrees Fahrenheit (excepting occasionally its superheat), but in pounds and cubic feet. Besides, some of the most competent writers about the subject seems to base their deductions on this very fact.

The reviewer takes issue with the statement, on page 51, that for equal power the consumption of denatured alcohol to that of gasoline will, on an average, be 1.5 of alcohol against 1 of gasoline, by weight. This statement is modified, to some extent, for a special type of engine, later on the same page, to 1.33 of alcohol against 1 of gasoline, by weight.

It is evidently not the intention of the reviewer to say that for equal power there will be required equal *weights* of the two fuels, though from what he states this would be inferred. Accounts of the tests of the laboratory engines from which his conclusions are drawn reports that for equal power the average fuel-consumption was equal *volumes* of denatured alcohol and gasoline; the specific gravities of which fuels approximate, respectively, 0.82 and 0.69. Hence, the consumption by weight was 1.2 of alcohol against 1 of gasoline.

This brings the results of these tests somewhat closer to the writer's figures. But it should be noted that in these tests the thermal efficiency of the alcohol engine was over 50% higher than that of the gasoline engine, which fact points toward the possibility that the gasoline engine might not have had a fair show. However, we have plenty of competent evidence that indicates that the result of these tests represents the average that can be expected in practice, with a limited amount of preliminary experimental work, about as well as the figure 9 represents the average of the first nine numbers. For instance, if we turn to page 410 of the gas-engine book we find there a gasoline engine test of extraordinary high thermal efficiency, and also alcohol engine tests of equally extraordinary efficiencies, and these tests tell entirely another story.

While having the opportunity, it may not be out of the way to say that the formula, on page 157, pointed out by the reviewer as incorrect should have been $\frac{1}{dv} = \frac{x}{B-x}$. Fortunately, the result derived from the incorrect equation, the formula $x = \frac{B}{1+dv}$, is correct, so that the deductions made later do not suffer from this error.

A. M. Levin.

910 Monadnock Bldg., Chicago, Ill., March 2, 1910.

REVIEWS.

Güldner's Valuable Book on Gas and Oil Engines Translated.

THE DESIGN AND CONSTRUCTION OF INTERNAL-COMBUSTION ENGINES.—A Handbook for Designers and Builders of Gas and Oil Engines. By Hugo Güldner, Chief Engineer and Director, Güldner-Motorengesellschaft, Aschaffenburg. Translated from the Second Revised Edition, with Additions on American Engines, by H. Diederichs, Professor of Experimental Engineering, Cornell University. New York: D. Van Nostrand Co. Cloth; 8¼ × 11¼ ins.; pp. 672; 36 plates, 728 text illustrations, and 151 tables. $10, net.

In our issue of May 14, 1903, the first German edition of this book was reviewed by the late Prof. Storm Bull, of the University of Wisconsin. We doubt not that many of our readers well remember the excellent and discriminating book reviews which Prof. Bull for several years contributed to the Engineering Literature Supplement. Prof. Bull's review opened with the following sentences:

> It does not seem that there can be any question but that the above book is the best reference work on gas, gasoline and oil engines which has yet been published in English, German or French. The author has set out to produce a work which was to be of the greatest help to the designer and builder of these engines, and in this, it seems to the reviewer, he has admirably succeeded.

After giving a synopsis of the contents of the book, Prof. Bull concluded by saying:

> It is the opinion of the reviewer that somebody could do the gas-engine industry and the technical world in general, in this country, a great service by translating the book. It would involve an enormous amount of work, as the tables would all have to be changed from metrical weights and measures to the corresponding English ones; but with the present progress in this industry in the United States, it would seem a pity if such a book as this should remain unknown to most of those interested in the subject, as will inevitably be the case if it is not translated.

Two years later, in 1905, the second (enlarged) edition of Guldner's work was reviewed by Prof. Bull in our columns. He gave it even higher praise than the first edition, and said:

> The reviewer still has the fervent hope that somebody will be found who will undertake the very large task of translating the book into English.

In view of this statement by so high an authority as Prof. Bull, it is almost needless for us to say that Prof. Diedrichs, who has translated the work, and the Van Nostrand Co., which has undertaken its publication, have performed a very valuable service for the mechanical engineering profession of America.

The price of the book may seem high. Most engineers are inclined to scrutinize a book pretty closely before they pay as much as $10 for it. It is interesting, therefore, to quote again from Prof. Bull's review of the first edition, in which he said:

> It seems a wonder that a book of this size and character can be sold for $6. If published in this country, does not seem probable that it could be sold for less than $10.

There is only one criticism to be made upon the publisher's work, and that is that by the use of smaller type and narrower margins the size and weight of the book might have been very considerably reduced. The present volume weighs 7 lbs. 11 oz., and is therefore not convenient to handle or to carry. Moreover, for a book which is likely to be much used and handled, as copies of this book are likely to be the weight and size makes a great difference in the durability of the binding.

The work of the translator deserves high praise not only because the vast amount of labor which has been performed in converting the tables referred to by Prof. Bull into English measure but for the unusual pains which have been taken to make the book an idiomatic translation into English, and not a more or less literal reproduction of the German idiom, which is too commonly the case in the translation of German technical works.

The book is in a way an object-lesson to American machinery manufacturers. We have often been struck by the extent to which the builders of German machinery, who are commonly supposed to be extremely secretive with respect to their products and methods freely afford, to the German technical publications and to the writers of technical books, drawings and data which in an American concern would be classed as trade secrets, by no means to be divulged.

Prof. Diedrichs has attempted to make the book more useful to its American readers by compiling himself a section relating to the design of typical American gas and oil engines; but, as he himself frankly states in his preface, there was extreme reticence on the part of many manufacturers to give out any information concerning their engines, and of the few engines which are described, much of the data is taken from trade catalogs and must be read with due allowance for the source from which it is taken.

About the only criticism that could be passed upon the works is that since the second edition appeared five years ago, there are some developments during the last half-decade which are not here covered. Most of these, however, have been in the field of special applications of the internal-combustion engine, rather than in the essential features of design.

The author, Mr. Hugo Guldner, in the preface to the first edition, expressed the hope that his book would prove an every-day working guide to the designer and constructor.' That hope has been fulfilled in Europe, where the work has long ranked as the standard authority. It is quite within the possibilities that its publication has had something to do with the rapid progress which has been made by Germany during recent years in gas-engine manufacture. We have no doubt that the English edition will be welcomed in every shop where gas engines are designed and built.

MASSACHUSETTS INSTITUTE IF TECHNOLOGY.—Class of '93, Fifth Catalog. (Frederic H. Fay, Secy., 491 Boylston St., Room 37, Boston, Mass.) Paper; 6 × 9 ins.; pp. 196; four plates.

It is sometimes claimed that students in the engineering schools lack something of the college spirit, the loyalty to their institutions, the pride in their respective classes, etc., that distinguish the undergraduates of the classical colleges. The publication before us is a rather remarkable illustration of the strength of class spirit among the graduates from the Massachusetts Institute of Technology in the class of 1893. This book of nearly 200 pages contain complete biographical record of the members of the class since their graduation, an index showing their geographical distribution, a record of the class meetings held, and other matter relating to the institution generally. Some very interesting pages are those which give the statistics of professional incomes earned by members of the class. It appears that in 1896, three years after graduation, 20 members of the class had incomes

averaging $1,098. In 1903, 185 members of the class had incomes ranging from $35,000 for the highest to $500 for the lowest, and the average was $3,082. In 1908, 152 members of the class reported: 2 of them were receiving incomes above $50,000; 4 others had incomes ranging from $20,000 to $50,000; 10 others had incomes between $10,000 and $20,000; 31 others had incomes between $5,000 and $10,000; 38 had incomes between $3,000 and $5,000; 25 earned between $2,500 and $3,000; and 37 earned between $1,500 and $2,500. This gives an average income for the 52 members amounting to $5,576 per annum; but it should be said that not all the members of the class reported, and that it is likely that those who did not report were among the number who were in receipt of small incomes.

Machine Design.

Reviewed by JOHN J. FLATHER,* M. Am. Soc. M. E.

ELEMENTS OF MACHINE DESIGN.—By Dexter S. Kimball, M. Am. Soc. M. E., Professor of Machine Design and Construction, Sibley College, Cornell University, formerly Works Manager, Stanley Electric Manufacturing Co., and John H. Barr, M. Am. Soc. M. E., Manager, Smith Premier Works, formerly Professor of Machine Design, Sibley College, Cornell University. New York: John Wiley & Son, London, England: Chapman & Hall, Ltd. Cloth; 5¾ × 9¼ ins.; pp. 446; 196 illustrations in the text. $3, net; English price, 12s. 6d., net.

This book is the outgrowth of the experience of the authors in teaching machine design to engineering students. It presupposes a knowledge of Mechanics and Kinematics, but an examination of the work shows a clear and concise presentation of the essential elements of the strength of materials, as noted in Chapter III. This discussion is presented not so much in the nature of a review as it is to make the application of rational theory to engineering problems more definite; at the same time it affords an opportunity of discussing the various formulas and of collecting in concise form the more important equations involving straining actions, with which the designing engineer must be familiar. The treatise is essentially a text-book for college students and the topics treated are necessarily presented briefly; yet the work is so well done that it forms a convenient reference book for the practicing engineer who will here find a convenient discussion of the fundamental principles of machine design, accompanied by such practical data as may be necessary to verify or modify rational theory.

In Chapter I. the general problem is discussed, in which the work of design is divided into four parts: (1) selection of the mechanism; (2) solution of the energy and force problem; (3) design of the various members so they will not unduly distort or fail under the loads carried; and (4) specification and drawing.

The authors say:

> The design or selection of the mechanism for a machine is governed by the manner in which the energy is supplied and the character of the work to be done; for energy may be supplied in one form of motion and the work may have to be done with quite a different one. If mechanisms already exist which will accomplish the desired result the problem is one of selection and arrangement of parts. But if a new type of machine is to be built, or a new mechanism is desired, the solution of the motion problem borders on or may indeed be of the nature of invention. While it is true that in most cases the mechanism and the relative proportions of its parts can be designed to suit the work to be done without reference to the energy transmitted, in general, it is necessary to know something about the energy transmitted before any definite dimensions of the parts of the mechanism can be fixed, and frequently before the nature of the mechanism is determined. Furthermore, the methods and available facilities of construction control the design to a large extent.

As would be expected from men of such wide practical experience, we find throughout the entire book a most satisfactory correlation of theory and practice. Where the forces acting are not always amenable to direct analysis, recourse must be had to experience as exemplified in the use of emperical formulas and the application of judgment. This is very clearly brought out in the discussion of the design of the more important machine details in the chapters which follow.

Under the last step given as one of the parts of design, namely, specification and drawing, it is shown that this is a necessary and important adjunct to the process; it is not machine design of itself, since machines may be designed and built without any drawings; but it is, nevertheless, an indispensable part of the designer's equipment, and constitutes a powerful aid to the designer's mental process. At the same time it is the best way of indicating to the workman what is to be done in order to construct the machine in question, while it also serves as a record of what has been constructed.

The discussion of energy and force is ably considered in Chapter II., in which the kinematic relations or changes in position and velocity of the various members of a machine are used to indicate changes in force. Applications are worked out in detail for the various cases which may arise in the transformation of energy; among these, the analysis of the forces acting in the reciprocating steam engine, and in a direct-driven air compressor, are typical examples which well illustrate the methods. Both graphical and analytical methods are employed, since the limitations of the graphical method may under certain conditions produce either indeterminate or erroneous results.

Chapter III. consists of 65 pages devoted to the theory of straining actions in machine elements and includes a discussion of the character of the forces which act upon and within a member; bending and twisting moments; moments of inertia; beam and column formulas; Wöhler's law; factors of safety, and in fact all the essential elements of the Mechanics of Materials. An interesting curve is noted (p. 52) for use in connection with formulas involving combined bending and twisting moments. The determination of shaft diameters, either under simple stress or combined bending and twisting moment, is discussed more in detail later (Chapter XI.), where a graphical method is given for solving shaft problems under any moment, and with intensity of stress from zero to 15,000 lbs. per sq. in. Under "Fatigue of Metals" the authors state:

> A theory which has been largely accepted is that every piece of metal contains innumerable minute flaws or imperfections, often originally too small to be detected by ordinary means. These "micro-flaws" tend to extend across the section under variation of stress, and may, in time, reduce the net sound section so greatly that the intensity of stress in the fibers which remain intact becomes equal to the normal breaking strength of the material. Many men of large practical experience still prefer wrought iron to mild steel for various members which are subject to constantly reversing stress.
>
> It is probable that the prejudice against steel is largely the result of unskillful manipulation of this more sensitive material; and the product of the best steel makers of to-day is much stronger and more reliable than wrought iron.
>
> However, it is just possible that the very lack of homogeneity in wrought iron renders it safer under varying stress (other things being equal), as the fibers are more or less separated by the streaks of slag, and a flaw is less apt to extend across the entire section than it is in the continuous structure of steel. Wrought iron may be likened to a wire rope, in which a fracture in one wire does not directly extend to adjacent wires.
>
> The "gradual fracture" through extension of "micro-flaws" seems to accord with the observed facts more closely than the older theory of general change of structure.

Chapter IV. relates to a general consideration of the theory of friction, lubrication, and efficiency. This is followed by a chapter on springs in which springs of various forms are quite fully discussed and formulas deduced for their various applications. Chapters VI. to IX. are devoted to the design of such machine parts as noted under riveted joints; screw fastenings and screws for transmitting power, with a discussion of the friction losses in same; keys and cotters; force and shrinkage fits; tubes, pipes, thin and thick cylinders, and flues are considered with respect to both bursting and collapsing pressures.

Under force fits (p. 205) an allowance of 0.001 in. per inch of diameter is given as representing average practice in this country "for such work crank shafts, crank pins, and in general where a tight fit is required. In the reviewer's opinion this statement should be qualified, for certainly in a large number of cases where forced fits are employed for such work, an allowance twice as great is used. For armature shafts where the construction of the armature and the facilities for forcing do not permit heavy pressures, the lesser allowance should be adopted. Chapter X. is devoted to the consideration of constraining surfaces as exemplified in sliding pairs; it includes a brief presentation of sliding surfaces such as crossheads, and similar forms, but the greater part of the chapter consists of a very complete discussion of the design of journals and bearings in which their lubrication becomes an important factor. Thrust bearings, roller bearings and ball bearings each receive due consideration, and the rules for designing these members are presented in convenient form.

Axles, shafts and shaft couplings are treated in Chapter XI., which is followed by a very full presentation of flexible transmitters such as belts, ropes, cables and chains. The theory of the transmission of power by belting is discussed at considerable length and the choice of suitable values for coefficient of friction and allowable stress is indicated. The various systems of rope driving are compared and considerable attention is given to chain transmission and the design of sprockets for same. Chapters XIII. and XIV., are devoted to considerations of various applications of friction, and the design of toothed gearing respectively. This includes the transmission of power by means of friction wheels; friction brakes; friction clutches and friction pulleys. Under gearing no attention has been given to the theory of correct tooth outline, since this properly belongs to the subject of Kinematics; at the same time it would seem that a brief presentation of the derivation of tooth profiles would increase the value of this part of the work. The Lewis formula is given for determining the strength of gear teeth, from which Mr. Barr has developed additional formulas for determining the pitch when the number of teeth is unknown. Interesting diagrams have also been constructed by which these problems may be solved graphically. Various forms of gears are discussed at length and formulas deduced for the design of bevel geers, helical or twisted and screw or spiral gears.

The design of fly-wheels and pulleys is presented in a very interesting manner in Chapter XV., and the applications to practical problems forms a valuable part of this discussion. In the opinion of the reviewer, however, this would be enhanced if more attention were given to the design of hub-and-rim bolting, including lugs; it would also seem as though a brief discussion of the usual proportions of arms and rim of belt pulleys should have been presented in connection with the subject of fly-wheel and pulley design. The final chapter discusses the stresses in machine frames and gives analyses of such frames as those of punching-machines, and vertical steam engines, representing open and closed types respectively. The distribution of metal, attachment of support, stability and harmony of design are well handled. In this connection the authors state:

> Complex curves and ornate features are not only useless but expensive. It is not always possible or desirable to make machine frames and supports with simple straight-line outlines; but where curves are necessary they should be as simple as possible; and in general the best results can be obtained by using arcs of circles or parabolas. Ornamentation of a fanciful nature is not permissible anywhere, as it really detracts from the appearance of the machine, and adds to the cost of production. Harmony of design can be attained by making the various members of correct proportions to withstand the loads brought upon them, and by using the simplest and most direct design with smooth transition curves between straight lines which intersect. It is a proverb in design that "what is right looks right."

It is doubtful whether any portion of this work could be omitted or reduced in content without affecting the value of the book; the criticism might be made that its value would be greater had some attention been given to the Materials of Machinery since a designer must have a good conception of the behavior of the materials with which he deals; nor would this replace his more extended study of Materials elsewhere in his course, any more than the chapter on straining actions would stand as a substitute for the Mechanics of Machinery. However, it is difficult to compass all the desirable features of so large a subject as Machine Design within the limits of one volume, and the authors are to be congratulated in bringing out a work so complete and so well adapted to the needs of the engineering students in American technical colleges.

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Notable British Books on Town Planning.

TOWN PLANNING.—Past, Present and Possible. By H. Inigo Triggs, A. R. I. B. A. London, England: Methuen & Co. Cloth; 7 x 10¼ ins.; pp. 334; 173 illustrations, partly in the text. $6.

TOWN PLANNING IN PRACTICE.—An Introduction to the Art of Designing Cities and Suburbs. By Raymond Unwin. London, England, and Leipsic, Germany: T. Fisher Unwin. Cloth; 7¼ x 10 ins.; pp. 416; 298 illustrations, partly in the text, and 6 folding maps. 21s., net; American price, $8.40.

When we consider the antiquity and present number of cities, it seems remarkable that the literature of city or town planning has until recent years been so very meager. This is doubtless largely due to the general absence of careful planning which has been characteristic of the growth of most cities. The exceptions have been so few, or else have had such an origin, as not to lead any one, up to recent times, to undertake a systematic treatise on the subject of city planning.

The German people seem to have been the first to awaken to the desirability of introducing a system in street planning, and the predilection of the Germans to reducing to written language their ideas and practice on any subject resulted in the production, some years ago, of several valuable treatises, and later in the establishment of a journal ("Der Stadtbau"), devoted to city and town planning. The transformation of the city plan of Paris by Baron Haussmann and his associates, somewhat after the middle of the 19th century, did much to draw attention to city planning possibilities and has led to many dissertations on what has been accomplished in the French capital.

British cities as a whole seem to have been remarkably negligent of everything pertaining to systematic city planning until within the past few years. Comparatively little important town planning reform has yet been accomplished in Great Britain, but the way for it has been paved by the Town Planning Act, passed toward the close of the last session of Parliament and outlined and discussed in the editorial columns of the main part of this issue of Engineering News. While little has yet been done in Great Britain in the way of reforming the plans of existing cities, there have been a number of notable attempts at both scientific and artistic town planning in connection with the laying out of new towns and the suburbs of old ones. These attempts have been associated largely with housing and sociological reforms, most of which have been due to the public spirit or the interest in their workmen shown by proprietors of large industrial plants. Notable instances of this sort are Port Sunlight, which provides housing for employees of the large soap industry of Messrs. Lever Bros., and Bournville, which serves in the same manner the employees of the large cocoa works of Messrs. Cadbury Bros. The houses at Bournville, however, are open to others than the employees of the works named. A later and comparatively recent advance in England has been due to the Garden City Association. As an outgrowth of its efforts the Garden City Co. bought 3,800 acres of land at Letchworth in 1903 and started a town of that name. Since then other Garden City associations have been organized in England. There are also similar associations in Germany. The main object of the Garden City Movement is to provide houses of low and moderate cost or rental, in comparatively rural districts, and with much consideration given to matters of healthfulness of the home and the general convenience and artistic qualities of both the individual homes and of the towns as a whole.

In ways which we believe are quite peculiar to this country, the United States, during the past five or ten years, has shown a large number of examples of intelligent, systematic effort directed to the improvement of the general plans, comfort and convenience and artistic qualities of American cities and towns. Most of this American effort has been due to private as distinguished from public initiative; that is to say, civic associations and various commercial organizations seeking to better municipal conditions have, through the appointment of committees or the engagement of experts in various phases of town planning, made a study of local conditions and formulated far-seeing plans for improved ways of communication through broader, better directed and handsomer streets. These plans have also included suggestions for parks, parkways and civic centers. In connection with this work a considerable number of men, drawn from either the architects or the landscape architects chiefly, have specialized in city planning. Notable among these have been Mr. D. H. Burnham, of Chicago; Mr. Charles M. Robinson, of Rochester, and Mr. John Nolen, of Cambridge, Mass. There have, however, been a number of others.

Mr. Robinson deserves special mention here, because to him we are indebted for the first two American books on town planning. The first of these, entitled "The Improvement of Towns and Cities," dealt largely with what perhaps might be termed some of the practical fundamentals of town planning, while the second, "Modern Civic Art," took up the subject more largely from the esthetic viewpoint. (For reviews of the latter see Eng. News, July 16, 1903, and April 13, 1905, for the first and second editions, respectively. A third American book, conceived from a very different point of view but yet well worthy of mention here, is Hurd's "Principles of City Land Values," (see Eng. News, March 17, 1904). Although Mr. Hurd's book was written from a commercial real-estate standpoint, it nevertheless contains much information of value to every one interested in city planning. It might well be consulted even by those who are taking up the subject solely from the esthetic viewpoint, because it is necessary for the most esthetically-inclined of city planners to consider the commercial aspects of their subject if they are to succeed in securing the adoption of their plans.

During the year 1909 the literature of city planning was greatly enriched by the publication of the two British books which are named at the head of this article. Aside from several publications, mostly limited in extent, devoted to the "Garden City" and allied movements, the books by Triggs and Unwin are, as far as we know, the first comprehensive British books on city planning. Each author draws largely upon the German literature of the subject, and each gives no little credit to the United States for its recent progress in town planning matters. Mr. Triggs in particular seems to have got in touch with almost everything in the town planning line thus far attempted in the United States. Mr. Unwin shows no lack of either information or appreciation of what has been done in this country, but he considers our American efforts more judicially than does Mr. Triggs, and seems perhaps to understand that there has thus far been more of effort than of achievement in the United States.

Mr. Triggs' book is a well-balanced general survey of his subject, but it contains sufficient detail to bring out the main points presented. It is not so detailed as is the book by Mr. Unwin. It has fewer pages of text and fewer illustrations than has the book by Mr. Unwin, and the use of large and heavily leaded type reduces still further the relative amount of information conveyed by Mr. Triggs' book. Because of his briefer and somewhat simpler treatment, the book by Mr. Triggs, of the two, may very well serve as an introduction to the subject. We say introduction, because those who can afford the outlay would do well to provide themselves with both books. Only to a limited extent do the two books duplicate information.

After an introductory survey of his subject as a whole, Mr. Triggs presents an interesting and excellent review of "Types of Ancient and Modern Towns." He then takes up in succession "The Circulation of Traffic" (more particularly vehicular traffic in the streets), "Town Expansion," or the growth of cities outward, "The Planning of Streets," and "The Planning of Squares and Open Spaces." Numerous plans, both of the whole or the major part of cities and of limited city areas, are introduced to illustrate the points made, as also are a number of excellent half-tone views. An interesting and useful feature of the chapter on the circulation of traffic is giving on the left-hand page the main street system of the city, and on the right-hand page a "theoretical plan of the traffic circulation." Another feature of this chapter is the reproduction of a considerable number of street intersections, with lines drawn to illustrate the movement of traffic and the number of possible collision points for different types of street intersection, together with suggestions for gyratory regulation of traffic. These diagrams and the accompanying discussion are based on propositions made some years ago by Mr. Holroyd Smith, as worked out in detail in a presidential address before the Civil and Mechanical Engineers' Society, delivered Oct. 3, 1907, by Mr. W. N. Twelvetrees (see Eng. News, Nov. 14, 1907). It should be noted here that this general subject of traffic circulation at street intersections is also taken up and illustrated by diagrams in the book by Mr. Unwin, but he gives credit for these to Mr. Camillo Sitte.

Another interesting series of diagrams in Mr. Triggs' book, which will perhaps be useful to some of our readers, shows what may be termed the natural illumination of buildings on either side of north-and-south and east-and-west streets, at different times of the year. Curves are drawn showing the portions of the buildings which receive sunlight for different numbers of hours. These diagrams are credited to Mr. William Atkinson.

Taking up now Mr. Unwin's book, we may note first of all that one of its most distinguishing features is a knitting together of text and illustrations. This has been done without burdening the text with reference to the many plans and diagrams, pen sketches and half-tones with which the book abounds. The references to illustrations are given in the page margins. The references range backward and forward in relation to text, thus giving the author greater freedom in the grouping of his illustrations and at the same time enabling him to enforce several distinct points at one place in the text, even though it is impossible to bring all the illustrations mentioned together at a given point. At the same time, the illustrations are placed as closely as may be to the related text.

As we have already indicated, Mr. Unwin's treatment of the subject is broader and in some respects both deeper and more detailed than that of Mr. Triggs. Mr. Unwin gives more consideration to the sociological and economic ramifications of his subject than does Mr. Triggs.

A general idea of Mr. Unwin's plan and detailed methods of treatment may be given by a survey of the contents of his book. He opens with a chapter on "Civic Art as the Expression of Civic Life," proceeds with "The Individuality of Towns, with a Slight Sketch of the Ancient Art of Town Planning," and then gives a very sane discussion "Of Formal and Informal Beauty." In the last-named chapter he illustrates some of his main points by helpful references to the corresponding schools of landscape architecture.

A chapter on "The City Survey" contains some useful hints on studies for city planning not to be found in the book by Mr. Triggs.

Having thus presented the subject in general, Mr. Unwin takes up its details. He begins with boundaries and approaches, then goes on with centers and enclosed places, devoting particular attention to the esthetic features of the latter. Next come two chapters on roads, the first dealing with main roads and the second with both minor or residential roads and detailed site planning in general. The "spacing and placing" of buildings and fences is next considered, and after this buildings themselves are taken up and an attempt is made to show "how the variety of each must be dominated by the harmony of the whole." A brief but important chapter is given to "Cooperation in Site Planning, and How Common Enjoyment Benefits the Individual." The final chapter is on building by-laws. These are considered chiefly from the British viewpoint, and the phases of by-laws considered do not relate to building construction but rather to the heights of buildings in relation to width

of streets, and the percentage of lot areas which may be covered by buildings, and how the open spaces and lots must be disposed to meet with the requirements of British by-laws. While this chapter is in some respects more local than general in its application, it nevertheless contains many hints of possible use to city planners in other countries.

A useful bibliography, classified into publications in the English, German and French languages, is given.

The illustrations include some quite large-scale folding maps, as well as many small maps of cities and many diagrams of small portions of cities and street intersections. In several instances the detail plans of small portions of cities are supplemented by a number of photographs taken from points indicated on the plan, the object being to show the effect of a given building or a group of buildings from different viewpoints both physical and mental. The half-tone reproductions and photographs given in this volume are both well chosen and handsomely reproduced. In addition to the half-tones, many perspective pen sketches are given.

We take great pleasure in commending each and both of these books to all who are interested in the many phases of city planning indicated by our partial exhibit of their contents. We suppose it is too much to hope, for the present, that every city engineer responsible for laying out streets will obtain and make use of these volumes, and also of those of Robinson and Hurd mentioned above. But it would be a profitable thing, both for city engineers and municipalities which they represent, if it were done. It goes without saying, that all architects and landscape architects who make any pretense of efficient work in connection with the laying out and improvement of cities will add these two books to their libraries, it being assumed that they already possess the others just mentioned.

The Gas Turbine.

THE GAS TURBINE.—Progress in the Design and Construction of Turbines Operated by Gases of Combustion. By Henry Harrison Suplee, M. Am. Soc. M. E., Author of "The Mechanical Engineer's Reference Book," etc. Philadelphia, Pa.: J. B. Lippincott Co. Cloth; 5½ × 8¾ ins.; pp. 262; 93 illustrations, mostly in the text. $3, net.

The author frankly states that in this book he has brought together, from the transactions of various technical bodies and from the records of private investigators, as well as from the files of many periodicals, information, in the shape of theoretical deductions and experimental data, on a type of prime mover that exists only in an experimental and unsettled form. This is done, the author states, under belief that engineers and mechanics who may be working on such apparatus should know what others have done, and that their results have been generally inaccessible. No attempt is made to digest these papers for the reader.

In the introduction and first chapter, a clear and simple picture of what is sought for in gas turbines is given—the combustion, under pressure, of a gaseous or liquid fuel and the expulsion of the resultant products upon the blades of an impulse wheel. In this first chapter progress from the earliest types is briefly passed over—but with as much attention as the meager development demands.

A remarkable paper, reprinted in full for its historical value, is Tournaire's "Notes on Reaction Turbine Devices for the Utilization of the Motive Power Developed by Elastic Fluids," communicated in 1853 to the Académie des Sciences of France. In these notes the general requirements for successful multi-stage turbines, working on steam or hot gases, are laid down, and it is seen that the latest developments in steam practice satisfy Tournaire's analysis.

The rest of the book consists almost wholly of reprinted papers and discussions. One of these is by Mr. R. M. Neilson before the British Institution of Mechanical Engineers; another is the paper of M. L. Sekutowicz, before the Société des Ingenieurs Civils de France, while the discussion of this paper by several French engineers forms a separate chapter following the original paper. The third paper is on the experimental work of Dr. C. E. Lucke, of Columbia University, New York City, on the behavior of gases in nozzles. The fourth is a discussion of the machine of Armengand and Lemole, and of that designed by one Karavodine. All of these men lived in Paris.

The Neilson and Sekutowicz papers are largely discussions of the thermodynamics of the several possible forms of internal combustion turbines. The discussion on the Neilson paper is given apparently verbatim, and perhaps a few carping critics may object to reading congratulatory remarks not closely related to the technical points of the paper. The discussion on the Sekutowicz paper is more condensed and confined. While Mr. Suplee appears as author of this book rather than as compiler, yet he has not pointed out, as might have been expected in some quarters, the important and minor points of the papers, and the reader is left free to pick and to choose as he sees fit or feels able.

The most practical machine yet devised (the Armengaud-Lemale), as shown by this book, seems to be a Curtis type of wheel acted on by a mixture of burned gases and steam. The gases result from the continuous combustion of a hydro-carbon vapor or liquid in a pear-shaped combustion chamber which is also supplied with compressed air. The combustion chamber has a refractory lining and the steam is generated by a water jacket. At a speed of 4,000 r. p. m. the experimental machine develops 300 HP. over and above the work absorbed by the compressor. The Rateau type of centrifugal compressor was developed primarily as an adjunct to this machine, it is stated. This latter apparatus (as shown in Engineering News, Jan. 20) is capable of delivering air at pressures up to 60 lbs. per sq. in., and with a maximum efficiency of about 70%. The small efficiency of the combined apparatus as a prime mover is somewhat lower than that of a good reciprocating gas engine of the same capacity.

In all the papers included in this volume the cry is for more data, and in closing the compiler adds a word, asking that the engineering schools of the country take up the study of the problems involved.

RURAL HYGIENE.—A Hand Book of Sanitation Designed for the Use of Students in the Agricultural Schools and Colleges, and for the Residents of the Rural Districts of the United States. By Isaac Williams Brewer, M. D. Philadelphia and London: J. B. Lippincott Co. Cloth; 5 × 7¾ ins.; pp. 227; 23 illustrations, partly in the text. $1.25, net.

It is gratifying to note the publication of late of a number of serviceable books designed especially for the sanitary guidance of people living in the country. The volume before us is in some respects broader than others which have appeared on the same general subject. Thus, the very first chapter is on "Work and Recreation." In the chapter on "Schools," the question of backward children is briefly discussed; while in addition there is a chapter on "Food and Diet," and another—and a judicious one—on various alcoholic drinks. There is also a chapter on "Country Stores, Jails, and Good Roads."

The other topics treated are more in line with what one usually finds in such books. They embrace, among other things, water, the disposal of various household wastes, and eight chapters on communicable diseases. Proper emphasis is put on milk and its relation to health. There is a short chapter on "Flies, Manure, and Slaughter-Houses," and, quite properly, hogs are given a chapter by themselves.

The author falls into an error common to medical writers and others unfamiliar with the technical and economic aspects of sewage disposal. That is, offhand assertion that it is an economic sin not to utilize the sewage of cities for the fertilization of agricultural land. He makes the same general assertion as regards street sweepings. And yet, when he comes to discuss matters with which he apparently has greater familiarity, he qualifies his remarks as to the saving of fertilizing values which might be effected by the proper housing of stable manure on farms, by raising a question as to whether manure sheds would really pay, economics alone considered. If the farmer cannot afford to so handle the manure produced in bulk on his own premises as to conserve all or nearly all its value, how does the author expect the city to recover the very small percentage of fertilizing value which sewage contains? The same general question applies to the utilization of street sweepings. Of course by raising these questions we do not mean to belittle the importance of the sanitary disposal of any class of wastes.

SELECTED ARTICLES ON THE INITIATIVE AND REFERENDUM.—Compiled by Edith M. Phelps. Minneapolis, Minn. The H. W. Wilson Co. Cloth; 5¼ × 7¾ ins.; pp. 164. $1.

Somewhat the same general plan has been followed in compiling this book as was used in making up the volume on the commission plan of city government noted in our issue of Feb. 17. That is to say, reprints, more or less condensed, of various scattered magazine articles, have been brought together. There seems to be more of repetition in this volume than in the other one named, and this one suffers in comparison through not having the articles classified according to the side of the argument which they are supposed to sustain. A useful bibliography is included.

STEEL MAINS FOR GAS DISTRIBUTION.—By Walter Hole, Superintendent Leeds Corporation Gas Mains and Distribution Department. Some Notes on Modern Gas-Main Laying; by W. H. Y. Webber. London, England: Local Government Officer & Contractor (36 Whitefriars St., E. C.). Paper; 4½ × 7¼ ins.; pp. 43; 21 illustrations in the text. 1s.; American price, 50 cts.

These papers are reprinted from the "British "Local Government Officer." The first one includes a brief and interesting review of the use of steel mains for distributing gas, and includes many details of longitudinal and circumferential joints and the methods of making service connections. The second gives some interesting and suggestive details of laying gas mains and services, including choice of materials, specifications for cast-iron mains, notes on "unbreakable steel mains," and service connections. One paragraph is headed "Lead Remains Indispensable," relating, of course, to joints.

THE QUALITY OF SURFACE WATERS IN THE UNITED STATES.—Part I.: Analyses of Waters East of the One Hundredth Meridian. By R. B. Dole. Water-Supply Paper 236, U. S. Geological Survey; George Otis Smith, Director. Washington, D. C.: Pub. Doc. Paper; 6 × 9 ins.; pp. 123.

A collection of periodic analyses of water from many of the rivers of the eastern part of the United States is given in this report, prefaced by a brief account of the methods of analysis used and of expressing results. To a considerable extent the work is made possible by the cooperation of various state, local and private interests, more particularly in the collection of samples.

REPORT OF THE NATIONAL CONSERVATION COMMISSION.—February, 1909. Special Message from the President of the United States Transmitting a Report of the National Conservation Commission, with Accompanying Papers. Edited under the direction of the Executive Committee by Henry Gannett. Senate Document No. 676, 60th Congress, 2d Session. Washington, D. C.: Pub. Doc. Paper; 6 × 9 ins.; pp. 276; six plates.

The report proper of this Comission consists of statements by secretaries of the water-resources, forests, lands, and mineral-resources divisions of the work of the Commission. The Joint Conservation Conference, whose proceedings are given, was held in Washington in December, 1908. The report of the proceedings includes addresses by various government and state officials, and individuals acting in their private capacity.

IRRIGATED LANDS OF UNITED STATES, CANADA AND MEXICO.—By Charles R. Price. Supplemented by Irrigated Lands of the West Coast of Mexico, by J. Clyde Power. Los Angeles, Cal.: Pan-Pacific Press. [Chicago: National Irrigation Journal (120 Sherman St.)] Paper; 5¾ × 8¾ ins.; pp. 208; folding plates and text illustrations. Paper, 50 cts.; cloth, $2.

After some general information regarding United States Reclamation work, the Carey Act, under which public lands have been granted to the states for irrigation development by private companies, laws relating to taking up public

lands, and a partial reprint of Bulletin 168, Office of U. S. Experiment Stations ("The State Engineer and His Relation to Irrigation"), this pamphlet proceeds to give a considerable amount of information regarding irrigation works and projects in various states of the Far West. Tables of statistics are given for some of the states. The paper on Mexico, by Mr. Power, takes up only eight pages. Altogether the pamphlet brings together a considerable amount of information which for most people would not be available without much search.

Two Electrical Books.

Reviewed by HENRY H. NORRIS.*

THE DYNAMO.—Its Theory, Design and Manufacture. By C. C. Hawkins, M. Inst. E. E., Assoc. Am. Inst. E. E., and F. Wallis, M. Inst. E. E. Fifth edition, rewritten, revised and enlarged. In two volumes. New York: The Macmillan Co. London, England: Whittaker & Co. Cloth; 5¾ × 9 ins.; pp. 1134; 594 illustrations in the text. $5.50, net.

ELECTRIC POWER PLANT ENGINEERING.—By J. Weingreen. New York: McGraw-Hill Book Co. Cloth; 6 × 9½ ins.; pp. 431; 291 illustrations, partly in the text. $5, net.

A comparison of the present edition of "Hawkins and Wallis" with the first edition (1893) shows the remarkable progress which has been made in the design and construction of electric generators since that date. Then there was no standard construction of alternators and direct-current generators. Each of the many manufacturing companies produced an individual type of machine, exhibiting the eccentricities of the designer. The design of the field frame offered the best opportunity for the display of individuality, and as a result the student of that time was bewildered by the variety of forms which confronted him.

The typical machines illustrated in the first edition of "The Dynamo" are not to be seen today except as historical specimens. The variety of types was so great that the authors felt constrained to arrange a classification. They first designated all machines as either "bipolar" or "unipolar," a unipolar generator being one in which a conductor always cuts flux in the same direction. Either of these might have its armature conductors located perpendicular or parallel to the axis. Either the bipolar or the unipolar armature could be constructed in one of four ways: (1) conductors on the curved surface of a cylinder (drum type); (2) conductors coiled around a long ring (ring type); (3) conductors coiled around a flat ring, the active conductor being on the flat surfaces (diskoid or flat ring type); and (4) flat coils with radial active conductors, with or without cores (disk type). Any one of these armatures might or might not be provided with a commutator. Of the 16 possible revolving armature types all but two were assumed to be practicable and nearly all were represented in commercial practice. The authors did not suggest the classification of alternators as "revolving-armature" vs. "revolving field," which would have given still greater variety with corresponding complexity. The "state of the art" in 1893 was so unsettled that it was impossible to predict which type or types would persist, or if, in fact, new ones would not be developed. All of this is in marked contrast to present practice which is standardized to a great extent. The advent of the turbo-generator has necessitated a new advance in design on account of the high peripheral speed, but otherwise improvement is now in the details of design, and in the materials of construction.

When "The Dynamo" was first written it was one of a very small number of books devoted to its subject and it was considered excellent for the time. Viewed from the present standpoint the machines and methods described are crude. The present edition is modern in form and much more pretentious in scope. Unfortunately, some of the crudities of the early editions still remain, notably the description and illustration of obsolete types of machines. The introductory chapters are too expansive, also, and could be boiled down into a few pages. As the book now stands it is a treatise for specialists and advanced students. These may be assumed to know that the mechanical reaction between a magnetic field and a current is proportional to the density of flux, the current, and the length of active conductor, without requiring 14 pages of explanation.

The elaborate treatment of the laws of alternating-current circuits hardly belongs under the present title, unless the authors assume that this book is to be used as the reader's main source of electrical information. The classification of all kinds of generators, which may have been necessary in the first edition, for the reasons already stated, should now either be placed at the end of the work or, preferably, omitted. It is confusing to know that there were once so many kinds of machines, but if we must know it (which is doubtful), the later the better. It is difficult to classify "dynamos" or anything else, until some knowledge, which needs classifying, has been accumulated, hence the descriptions of typical machines should precede the classification, in this case. It is to be regretted that the publishers have been obliged to issue the book in two volumes, particularly as these are not separated by any natural line of cleavage. By condensation in the elementary part, as already suggested, it would be easily possible to bind the whole in one volume.

From these criticisms of what are really minor matters it is a pleasure to pass to a consideration of the many interesting and useful features. As a whole the book gives an excellent view of modern British and American practice in the design and construction of alternators and direct-current generators. The descriptions are clear and interesting and they are well illustrated with diagrams and pictures. The half-tones come out quite well enough to show the construction of all essential parts. The best feature, however, is the exhaustive treatment of a number of topics which must be understood by anyone who is to design or criticize the design of electric generators. Among these topics there are armature reaction (96 pp.), commutation (91 pp.), heating of dynamos (43 pp.), design of direct-current generators and alternators (100 pp.), and working of alternators in parallel (63 pp.). Most of the remainder is descriptive of armature and field construction and of the details of assembled machines. In connection with the text are numerous references to standard monographs by the best authorities. This feature is not overdone as in some books, but the references given are apparently the best obtainable.

The newer parts of the book are the best, and if the early editions, excellent as they were, could be cut loose from entirely, greater unity would result. That the book is a development is shown, for example, in the treatment of armatures. Chapter XI. is entitled "closed-coil armatures," while XIII. is "continuous-current armatures." The first, which deals more with principles, is a relic of early editions. The second, which is modern, takes up in a clear manner all of the details of successful construction. The two should be combined. A few words of explanation of principle would suffice in connection with the excellent material on construction. In Chapter XI. valuable space is wasted by describing obsolete ring and surface windings, which give the impression that the subject is complicated, whereas in reality it is very simple. Further, it is obviously unimportant whether a winding is right or left-handed, or how many poles it is designed for, etc. Once the underlying principle is understood, all of the details follow naturally.

The reviewer has been familiar with "The Dynamo" since the first edition appeared; in fact, he used it as a recitation text in this form. Experience has shown that its real place is as a reference text for designers and advanced students. It could be well used to accompany a lecture course. The descriptive parts will make useful reading for those who desire an accurate knowledge of present practice in this field, even if they do not care for the theory. The book in its improved form will maintain its high rank among electrical reference works.

The title of Weingreen's "Electric Power Plant Engineering" would naturally lead one to infer that the general field of that subject is covered. This is not the case, as the actual subject is the control of the electrical machines and circuits. The apparatus used for this purpose is designated as "switchgear" by the author, who says:

> Under this collective term we include all apparatus, instruments, cells, and compartments with their connections, as well as accessories and place of installation, as distinguished from the term "switchboard."

The meaning of this rather ambiguous sentence can only be understood after a glance through the book. The contents are seen to include such equipment as rectifiers, storage batteries, oil and other switches, circuit-breakers, relays, potential regulators, switchboards, etc. The book contains a large amount of material, most of which is available elsewhere, but which is here arranged for convenient reference. The reader has also the benefit of the author's judgment regarding numerous details of design and construction. The author says:

> All conclusions set forth herein are based on personal experience and a careful study of recognized standard constructions and the opinions of such authorities as Prof. Charles P. Steinmetz, Dr. Louis Bell, Frank J. Sprague, W. C. Gotshall, Paul M. Lincoln, Prof. Dr. F. Niethaimer, Stephen Q. Hayes, and others.

The publications of these and other authorities have been drawn upon for the most of the matter given; in fact, the whole book may be characterized as a compilation of American Institute of Electrical Engineers papers, trade bulletins, and other easily-accessible sources of information. Such compilations are desirable and *if issued in inexpensive form* should find a wide field of usefulness. The information is, however, largely of current interest, as practice is changing rapidly. Hence a hand-book is the most natural repository for this easily-obtained material. This remark does not apply to the descriptions of typical power stations and substations which appear at the end of the book. These are more in harmony with the general title. The nearest approach to the subject proper is Chapter XXIV., Central Stations, which occupies five pages and contains a superficial discussion of the advantages of alternating-current stations, power-station location, auxiliary devices of all kinds, cost comparison, kinds of service, etc.

Mr. Weingreen's book is open to considerable criticism as a piece of book-making. The misleading title has been mentioned. Some of the chapter titles are also peculiar. For example, under "direct-current generators" we find mainly descriptions and illustrations of switchboard panels and switches. A chapter (?) labelled "direct-current motors" consist of 1¾ pages of text and two switchboard diagrams. This chapter holds the record for brevity.

There are liberal extracts from switchboard specifications, as in pages 318 to 326 and 386 to 389. These are mere lists of details of apparatus and are rather dull reading. They are also expensive at the rate of 1.16 cts. per page. The book contains a number of blank and nearly-blank pages which are all carefully allowed for in the numbering, so that the net quantity of reading matter is much smaller than that indicated by the number of the last page (431). The text is still farther reduced by the large number of cheap cuts, most of which are to be found in bulletins, periodicals, etc.

It is interesting to compare this book with one issued recently under the companion title "Steam Power Plant Engineering" by G. F. Gebhardt, because the two books would be assumed by the titles to be similar in general scope. The latter contains 816 pages of material, all of which is directly related to the title, and it sells for $6, or less than ¾-ct. per page. An electrical book along the same lines and executed in a similar fashion would have met a real need.

In comparing Mr. Weingreen's book with other electrical books in the same field it would appear that the needs of most engineers may be met nearly, if not quite, as well by the "Stand-

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ard Hand-book" or by "Foster," which books contain also much information on other lines. Bell's "Electric Power Transmission" and Adam's "Electric Transmission of Water Power" have good chapters on switchgear. Probably best of all is the file of the "Electric Journal" in which special attention has been given to the subject, and from which Mr. Weingreen has apparently derived much assistance.

An American and a British Book on Plumbing, Water-Supply and Hot-Water Heating in Buildings.

THE WATER SUPPLY, SEWERAGE AND PLUMBING OF MODERN CITY BUILDINGS.—By Wm. Paul Gerhard, M. Am. Soc. M. E. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Cloth; 5¾ × 9 ins.; pp. 493; 239 illustrations, partly in the text, and 15 tables. $4, net; English price, 17s., net.

DOMESTIC SANITARY ENGINEERING AND PLUMBING.—Dealing with Domestic Water Supplies, Pump and Hydraulic Ram Work, Hydraulics, Sanitary Work, Heating by Low Pressure, Hot Water, and External Plumbing Work. By F. W. Raynes, Medallist, City and Guilds of London Institute, Head of the Plumbing Department, and Assistant Lecturer in the Department of Civil Engineering, The Glasgow and West of Scotland Technical College, Glasgow, London, New York and Bombay: Longmans, Green & Co. Cloth; 5½ × 8¾ ins.; pp. 474; 277 illustrations in the text. $3, net.

Allowing for different conceptions of what is included in the terms "engineering" as used in Great Britain and the United States these two books are quite similar in broad general scope, though widely different in detailed subject matter. In England, as some of our readers may not know, the term "engineer" is often used to denote what we should call a mechanic or metal worker and "engineering works" to include machine shops, engine and boiler works, and many other kinds of manufacturing establishments. Accordingly, the British book by Mr. Raynes gives a large part of its space to the fabrication of the material used in plumbing work, domestic water-supply and heating, and to the putting of the fabricated material in place. In contrast, as we would expect, Mr. Gerhard's American treatise scarcely touches on the manufacture of plumbing and other supplies, and treats installation problems almost wholly from the viewpoint of the designing and supervising engineer and architect.

Taking up first Mr. Gerhard's book it should be borne in mind (1) that he limits it, by title, to "Modern City Buildings" and (2) that he states in his Preface that it "is the outgrowth of various lectures on 'The Water-Supply of Buildings' and on 'Plumbing.'" He adds that while the chapters are "correlated to each other" yet each "is complete in itself, and may be read without reference to the others." This plan involves some slight repetitions, the author states, but he believes that nevertheless it has some decided advantages. Doubtless it does have advantages, but that there are disadvantages in going over the same ground several times in one book no one can deny. The result in this case is considerable repetition both of text and illustration; or, if not illustration, what is essentially a duplication of the information presented. Certainly an author who is continually referring his readers to others of his own books for information on the subjects which he is treating ought not to feel any hesitation to refer to other chapters in the same book.

Mr. Gerhard opens with a general discussion of what he terms "the hydraulic and sanitary engineering of buildings." This chapter is a fairly complete survey of the general subject. It is followed by a chapter on sanitary fixtures and appliances, which goes into much admirable detail. The third chapter is one of the best in the book. It explains and gives the reasons for simplified plumbing in place of the old complicated system of duplicate and even triplicate piping required to carry out misconceived notions of the necessity for separate ventilation of every trap and fixture. A companion chapter deals with plumbing in relation to preventable diseases, and municipal control of plumbing. Both topics are treated in a sensible and up-to-date manner. There may, of course, be differences of opinion as to whether the author is right in preferring that plumbing work be supervised by boards of health rather than building departments, but there is room for such differences, and the author presents his views forcibly.

Two chapters are devoted to the water-supply of buildings, after which the general subject of maintenance of pipe systems for water, sewage and gas is taken up. The main part of the volume is concluded with

a complete set of rules representing the best modern practice regarding plumbing, water-supply and sewerage, chiefly with reference to hospitals and large public institutions, though the substance of the rules is also applicable to other classes of buildings.

Appendixes give an extended collection of definitions of terms, an interesting account of the development of drainage and plumbing, and a useful "plumbing specification reminder." Finally, various conversion diagrams are given. It should be stated at this point that elsewhere in the volume a number of hydraulic and other diagrams are presented, so that altogether the book contains an unusually complete collection of diagrams likely to be serviceable to the engineer called upon to make calculations for the water-supply and sewerage of buildings.

Altogether the volume is certainly one of the best of the many on the same general subject which this prolific author has produced. Its usefulness should be judged in part by the extent to which it goes over very much the same ground as is covered by Mr. Gerhard's "Sanitation of Public Buildings" (see our issue of Dec. 12, 1907) and also "The Sanitary Engineering of Buildings," published in 1899, and numerous other variants. The writing of so many books on the same general subject does of course serve a useful purpose to those whose range of interest is limited; but for those who wish to have before them a comprehensive review of what might be termed, for convenience, the water and sanitary service of buildings, there would be a great saving in time, expense and shelf room if the subject were not approached from so many overlapping points of view. In fact, we cannot refrain from expressing the hope that before Mr. Gerhard terminates his very useful career as a writer of books on the subjects indicated he will consolidate all that he has written into considerably fewer volumes than are now represented under his name. If at the same time he will cut out duplications in each of the several volumes, still further benefit will have been rendered.

As we have already intimated, Mr. Raynes approaches his subject from an altogether different point of view. First of all, he takes up the various classes of material used in plumbing and related work and gives some account of the mode of their fabrication. He even goes so far as to give the geographical localities from which the various ores and other substances are drawn. He then takes up in succession roof work, pipe fixing and pipe bending, pipe joints, solders, fluxes and lead burning. These four chapters deal particularly with lead and its manipulations, but copper is also given consideration.

Next the various plumbing fixtures, piping systems, etc., for the removal of house wastes are considered. There is a brief chapter on small installations for the treatment of sewage.

Water-supply is next given attention, beginning with gathering grounds and continuing with the development of supplies from various sources. There is a chapter on pumps and pumping. Next comes a chapter on hydrostatics and hydraulics.

The two concluding chapters deal with hot-water supply. An appendix gives various hydraulic and other memoranda.

A feature of the book is the considerable number of "worked examples." These are distributed through the latter portion of the book, beginning with the chapter on house drainage and continuing on through the other chapters. Various useful tables and diagrams are given, but in general hydraulic diagrams are omitted, thus making this book a marked contrast with Mr. Gerhard's.

The book will be interesting to all who are curious to know the details of British plumbing work, both as regards the manipulation of material and the broader features of design and installation of fixtures. Doubtless many useful hints can be obtained as to the plumber's art in a country where it has long been practised and where rigid municipal supervision is exercised as a rule. The sections on roof work and the like present information not otherwise easily obtainable in this country. But how adaptable it is to American conditions we do not pretend to say. It goes without saying that for American readers Mr. Gerhard's book is far more useful than the one by Mr. Raynes.

A REVIEW OF TWENTY-ONE YEARS' EXPERIMENTS UPON THE PURIFICATION OF SEWAGE AT THE LAWRENCE EXPERIMENT STATION.—By H. W. Clark and Stephen De M. Gage. (Reprinted from the 40th Annual Report of the State Board of Health.) Boston, Mass.: Pub. Doc. Paper; 5¾ × 9 ins.; pp. 291; 20 illustrations in the text.

All engineers who are making a pretense of following the development of sewage purification will be grateful to the Massachusetts State Board of Health, and particularly to Messrs. Clark and Gage, for bringing together in convenient form a summary of the results in sewage purification obtained at the Lawrence Experiment Station during the first 21 years of the experiments. The character of sewage treated, sand and soil filtration, trickling [percolating] filters, contact filters and their operation, "the comparative disposal of organic matters by sand, contact and trickling filters," studies of preliminary methods of treatment, are each and all treated in considerable detail. There are also a brief section (three pages) on the destructive distillation of sewage sludge, some 25 pages on the bacteriology of sewage and sewage purification, and a few pages on the bio-chemistry of sewage purification.

THE PRESIDENT'S HOMES COMMISSION.—Reports. Washington, D. C.: The Commission (923 H St., N. W.; Dr. Geo. M. Kober, Secy.). Paper; 6 × 9¼ ins.

Report of The Committee on Improvement of Existing Houses and Elimination of Unsanitary and Alley Houses. By William H. Baldwin, Chairman of the Committee. Pp. 23; two plates.

Report of Committee on Building of Model Houses. By General George M. Sternberg, M. D., LL. D., Chairman of the Committee. Pp. 111; 40 illustrations, mostly in the text.

Industrial and Personal Hygiene. By George M. Kober, M. D., LL. D., Chairman of the Committee on Social Betterment, Professor of Hygiene, School of Medicine, Georgetown University. A Report of the Committee on Social Betterment. Pp. 175; one plate.

Report of Committee on Social Betterment. By George M. Kober, M. D., LL. D., Chairman of the Committee, Professor of Hygience, School of Medicine, Georgetown University. Pp. 281.

A large amount of information on what in England would be called the housing of the working classes is given in these pamphlets, but as will be seen by referring to the several titles, they are by no means confined to that subject. Many needed housing and sociological reforms are shown to be needed at the national capital. The report was made some time ago, but was delayed in publication, and its notice in these columns has been still further delayed.

REPLANNING READING.—An Industrial City of a Hundred Thousand. By John Nolen. [Cambridge, Mass.: The Author.] Boards; 6 × 9¼ ins.; pp. 107; folding and other plates, and numerous text illustrations.

The opportunities for improving the street plan of Reading, Pa., and making that city more convenient for traffic, more comfortable to live in, and more pleasing from an esthetic point of view, are set forth in an interesting manner in this report. Many views are given, showing present conditions in Reading, good and bad, and possible improvements. The suggestions for improvements are reinforced with numerous illustrations showing how like improvements have been made in other cities, some in this country and some abroad. Among the recommendations of the report are the relocation and improvement of some of the streets, the removal of overhead wires, the abatement of the smoke nuisance, a grouping of public and semi-public buildings, more appropriate bridges across the Schuylkill River, the provision of playgrounds, and the acquisition of various mountain tops, valleys, river banks and creeks around Reading, and their reservation and improvement for public parks and driveways. It is also suggested that an investigation and report on housing conditions in Reading might well be made.

Handbooks for Concrete Inspectors.

Reviewed by W. J. DOUGLAS,* M. Am. Soc. C. E.

CONCRETE INSPECTION.—A Manual of Information and Instructions for Inspectors of Concrete Work, with Standard and Typical Specifications. By Charles S. Hill, Associate Editor "Engineering-Contracting," Author of "The Chicago Main Drainage Channel," etc. Chicago and New York: The Myron C. Clark Publishing Co. London, England: E. & F. N. Spon, Ltd. Cloth; 3½ × 6¾ ins.; pp. 179; 15 illustrations in the text. $1, net.

INSPECTORS HANDBOOK OF REINFORCED CONCRETE.—By Walter F. Ballinger, Assoc. Am. Inst. of Architects, M. Am. Soc. C. E., and Emile G. Perrott, Assoc. Am. Inst. of Architects, Assoc. M. Am. Soc. C. E. New York: The Engineering News Publishing Co London, England: Archibald Constable & Co., Ltd. Flexible leather; 4¾ × 7 ins.; pp. 66; six folding plates, $1.

A handbook for concrete inspectors should contain information useful in obtaining concrete of proper quality, conforming to plans and specifications and also conforming to accepted but generally unwritten rules of practice. Such books should include in a general way the duties and powers of the inspector and his relation to both the contractor and engineer.

Inspectors of concrete work are divided into three general classes: (1) Technical inspectors of construction who are generally young and somewhat inexperienced college graduates. (2) Untechnical inspectors of construction who are generally ex-foremen. (3) Technical inspectors of materials, who determine upon the suitability of materials by means of laboratory tests.

The last class of inspectors should be technical experts and their methods may not properly be covered by a handbook of a manual of inspection. A handbook must be written either for technical or untechnical inspectors, or if not, it should be divided into properly headed chapters, so that the ordinary inspector may not be confused by technical information beyond his capacity. Neither of the books differentiate between these two classes and Mr. Hill's book contains in part information which is used only by the technical inspector of materials.

The relations of the inspector to the contractor and engineer are occasionally adverted to in each book, but it is believed not to the extent which this relationship warrants.

In the following comments, the reviewer has assumed that it is the duty of the inspector to supervise the building of concrete structures in accordance with drawings and specifications made by an engineer or architect and that it is not incumbent upon him to select the type of construction, type of reinforcement, the dimensions of the various concrete parts nor methods of procedure, but that it is his duty to report to the engineer improper design or specifications, so that prior to the actual construction the engineer may have an opportunity to refigure or respecify where insufficient size or bad work might result. An inspector need not have technical knowledge in order to pick out errors in design if he understands the general functions of the parts of the structure and the work that is done by the concrete and by the steel.

The making of cement and steel tests, the detailed calculations of girders, beams and slabs should not be placed upon the shoulders of an inspector, whose many duties do not permit him to go into lengthy mathematical computations nor laboratory tests.

Mr. Hill's Book.

This book contains much interesting information upon concrete, but is thought to be of more value in the writing of specifications and in design than for inspection. It is in part too technical for the average inspector and it contains throughout generalities and is deficient in detail. For instance, the interpretation of the specifications for sand cannot be made by an average inspector who has no knowledge of mineralogical terms. Nor is such a man competent to make a laboratory test of the cleanliness and voids of sand, nor if he had the ability would he have the time.

The generalities as, "See that the mixer is given the requisite number of turns for each batch," will not enable the inspector to determine whether or not the concrete is properly mixed. It would have been better to have stated that the mixer should be turned until the concrete was of uniform color or some equally definite method should have been specified. Statements that the work should be done under the orders of the engineer are hardly of value to the inspector. Such statements as "the accuracy of no detail shall be taken for granted" and that "all forms shall have ample strength to support properly the loads they are called upon to carry," are too general for inspection purposes.

The instruction "see that substantial foundations are provided for the center," make it appear that the inspector is carrying the burdens of the engineer. Similarly, it does not appear that the inspector is competent to determine whether or not suitable means are provided for striking and lowering centers.

It is stated that "the time for removing the forms, is that time when in the best judgment of the engineer, the contractor and inspector they can be removed without injury or danger to the concrete which they support." It was previously stated that the concrete should ring when struck by a hammer. This would seem to be a proper form of the rules to be given an inspector to govern him in the removal of forms, if the engineer or architect failed to specify the permissible time of removal.

Chapters 4, on the inspection of reinforcement; 5, on concrete; 6, inspection of sidewalks; 7, inspection of concrete piles; and 8, inspection of cast concrete work, give valuable information on these subjects, but it is given more in the form of a combined specification and building regulation than as an instruction to inspectors.

The specifications given at the end of the book have been carefully selected, and are a valuable addition to any library on the subject of concrete.

Ballinger & Perrot's Book.

The information contained in Chapter 1, "Forms or Falsework," is excellent, but this chapter would be much improved by figures and calculations which would enable the inspector to suggest proper design and to figure the efficiency of the forms and falsework proposed by the contractor.

In Chapter 2, "Reinforcement," much information is contained valuable to the designer, but comparatively little is said regarding inspection.

Chapter 3 is full of good ideas, but is more in the order of a specification than an instruction to inspectors. This chapter contains valuable information for the inspector and designer.

In the appendix, matter on the strength of reinforced concrete, beams and columns is given for the technical inspector. The ordinary inspector, however, is not competent to use this information.

General Criticism of Both Books.

What the inspectors need is detail information—how to interpret specifications. For example: if the cement has not been tested at the cement works, the inspector must know: (1) The number of samples which should be taken per number of barrels, or carload. (2) The weight of each sample necessary for the inspecting engineer to make laboratory tests. (3) The proper tool to be used in taking samples. (4) How to take samples that will represent an average. (5) How to examine cement for detrimental lumps. (6) How to determine if the proper amount of cement is contained in a bag or barrel. (7) How to store it, so that the various lots may be kept separate and accessible. (8) Size of house necessary for storage. (9) How to make simple records of tested and untested cement to expedite work. (10) If the cement has been tested at the cement works, the inspector must compare the bill of lading and car number with the certificate of test to be sure of the proper identification of the cement.

Specifications state in general that cement must be sampled but not the number or size of samples, nor how they shall be taken; that it shall be condemned for hard lumps, but not what constitutes a hard lump; they state that it shall be separated in carload lots, and the rest is left to the inspector.

Under forms, inspectors need to know the carrying capacity of timber beams and columns of various sizes and lengths; also the holding pow of fastenings, such as nails and bolts and t load or pressure of concrete on the forms. he does not know these things the only way i can determine upon the efficiency of the forn is by his own personal judgment, or when it too late. Timber tables giving the safe loa for timbers and columns and tables giving t safe load upon bolts and nails would be usef

A handbook on concrete inspection should b gin where standard specifications leave off. Wh is primarily needed is an explanation of t methods to be employed on the work in the i terpretation of specifications taken in conjun tion with plans, for the building of concre structures. Both of the books referred to follo too closely specifications, building regulation and office rules for design.

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MILK AND ITS RELATION TO THE PUBLIC HEALTH.—(By Various Authors.) Bulletin No. 56, Hygienic Laboratory, Public Health and Marine-Hospital Service of the United States; M. J. Rosenau, Director. (Revised and enlarged edition of Bulletin No. 41.) Washington, D. C.: Superintendent of Documents, Government Printing Office. Paper; 5¾ × 9 ins.; pp. 834; 67 illustrations, partly in the text. $1; supplied free to health officers who have not secured copies of the first edition, who should address The Surgeon-General, Public Health and Marine-Hospital Service, Washington, D. C.

The first edition of this valuable monograph was noted in our issue of May 14, 1908. That the work fills a great public need is indicated by the fact that the whole edition was soon exhausted. The shortness of time between the first and second editions has made it out of the question to bring some of the statistical matter down to date, but new chapters have been added on the relationship of the tuberculous cow to the public health, written by Dr. E. C. Schroeder, of the Bureau of Animal Industry, and on the thermal death point of pathogenic micro-organisms in milk, by Surgeon-General M. J. Rosenau. There are also additional matter on bacterial contents of top and bottom milk, contributed by Passed Assistant Surgeon John F. Anderson, and a chapter on the national inspection of milk, by Dr. H. W. Wiley, Chief of the Bureau of Chemistry, Department of Agriculture.

BOARD OF SUPERVISING ENGINEERS, CHICAGO TRACTION.—First Annual Report, Covering the Period Ended Jan. 31, 1908. Chicago, Ill.: The Board (Bion J. Arnold, Chairman). Cloth; 6 × 9 ins.; pp. 462; folding plates and text illustrations.

A brief history of street railways and street railway franchises in Chicago, and of the movements leading up to the recent settlement of difficulties between the city and street railway companies, occupies the first part of this volume. An outline of the traction ordinances of Feb. 11, 1907, which reduced the settlement to legal form, is next given, together with financial exhibits and estimates relating to the settlement. The main part of the volume is devoted to a report of Chief Engineer Bion J. Arnold, on the work of the Board of Supervising Engineers, Chicago Traction. This part of the volume contains a considerable amount of interesting technical matter. Next come the settlement ordinances in full, and digests of the meetings of the Board of Supervising Engineers. It may be explained that under these settlement ordinances the street railways of Chicago are being reconstructed and extended to meet the needs of the city, and that the city is receiving 55% of the net receipts of the railways after making capital allowances based on an agreed valuation.

FORMULAIRE DES CENTRAUX.—Résumé par Ordre Alphabétique des Cours et Projets de l'Ecole Centrale des Arts et Manufactures. By "J. B." Third edition, revised, corrected and greatly enlarged. Paris (VI°), France: H. Dunod & E. Pinaut. Flexible leather; 4 × 6 ins.; pp. 463; numerous text illustrations and tables. 7½ francs; American price, $2.25.

This handbook is grouped into separate articles or monographs arranged in alphabetical order like a cyclopedia. Such arrangement appears to be convenient in many ways, and perhaps accounts for the work having reached a third edition (second edition noted in our issue of July 14, 1904). The matter itself purports to be a summary of the instruction text of the Ecole Centrale des Arts et Manufactures; it is neither better nor worse than the contents of other handbooks. The civil engineer's work is practically unrepresented.

History of Forestry.

A BRIEF HISTORY OF FORESTRY.—In Europe, the United States and Other Countries. By Bernard E. Fernow, LL. D., Dean, Faculty of Forestry, University of Toronto. Toronto, Ont.: University Press, Cambridge, Mass.: Forestry Quarterly (396 Harvard St.). Cloth; 4¾ × 7½ ins.; pp. 438. $2.50.

A service to students of forestry, whether in schools or not, has been rendered by the compilation of this book. The author has brought together in compact and convenient form a mass of information regarding the development and (recent) status of forestry in the various countries of the world which very few other men could put their hands upon even after extended research.

Of the various countries treated, Germany receives the major part of the space, or about one-third of the contents of the book. This is largely but perhaps not wholly justifiable in view of the part which Germany has played in the development of forestry.

The book is the outcome of 25 lectures delivered a few years ago before the students of forestry in Yale University. It was first published in 1907 before the chapter on the United States had been written. The present edition, which was made available two years later, gives somewhat more recent information for the United States and Canada than for the other countries included.

The author reviews the history and development of forestry from nearly every point of view. In fact, his classification, particularly in dealing with Germany, is so detailed that there seems to be unnecessary repetition. This is exaggerated, particularly in the case of Germany, by chronological treatment by periods.

The usefulness of the whole work would be materially increased by the addition of a chapter summarizing the material advances in forestry with comparatively little relation to either chronology or the part played by the different nations in forestry development.

Few books need a comprehensive index more than this one, but an index of any sort is lacking. The table of contents, while satisfactory in itself, goes but a little way toward meeting the lack of an index.

YEAR BOOK OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Containing Lists of Members Arranged Alphabetically and Geographically. Corrected to Jan. 5, 1910. New York: The Society (Calvin W. Rice, Secy., 29 West 39th St.). Cloth; 4½ × 7¼ ins.; pp. xiv. + 370; eight plates.

The annual list of members, or "year book," of this Society appears this year in an entirely new and very convenient form. It is bound in cloth covers, is printed on thin paper so that the volume is of convenient thickness for the coat pocket, and the geographical list and regular membership list are combined. A new feature in the geographical list is that the business connections of the members are given, instead of merely the names. Besides these lists, the volume contains the membership of the Society's Gas Power Section, and also of the various student branches. The constitution and by-laws of the Society are given, with a thorough index, and there is a list of the public libraries where the "Transactions" of the Society can be consulted.

MODERN BRIDGES FOR ILLINOIS HIGHWAYS.—The Illinois State Highway Commission, Springfield, Ill. Pub. Doc. Paper; 6 × 9 ins.; pp. 34 (26 pages of illustrations).

While this brief pamphlet is intended specially for the information of municipal and local authorities, such as township committees and boards of supervisors, it will be of interest to engineers in that it shows how the Commission cooperates with such authorities in order to improve the character and economy of road bridges. About a page is devoted to general instructions as to the advertising and letting of contracts in such a way as to secure active competition. The half-tone engravings illustrate a number of defective and unsatisfactory structures, in comparison with others (both of steel and of concrete) of good and economical design. Some of these illustrations show a concrete girder bridge built for the Commission by convict labor for experimental work and subjected to a number of tests.

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New Power Plant Books

Electric Power Plant Engineering

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American Central Gas Engineering Practice.

Reviewed by W. CULLEN MORRIS,* M. Am. Soc. C. E.

CATECHISM OF CENTRAL STATION GAS ENGINEERING IN THE UNITED STATES.—Compiled from the Questions and Answers Sent Out to the Practical Class, Trustees Gas Educational Fund (Alfred E. Forstall, Secy.). New York: Trustees Gas Educational Fund (58 William St.). Cloth or flexible leather; 5¾ × 9 ins.; pp. 683; text illustrations. Cloth; $5, net, + postage; flexible leather, $7, net, + postage.

This book is of particular value to American gas engineers, as it is the only book on gas engineering published in this country that may be considered as containing information compiled by competent authorities.

The brief preface states that the matter contained in the volume was compiled from the questions and answers sent out to members of a "practical class," which has been taught by correspondence under, first, the direction of the committee on education of the Amercan Gas Light Association and, since 1899, by the Trustees Gas Educational Fund, but the preface does not state that the trustees of this fund were representative of the highest authority in American gas engineering practice.

Under the direct supervision of the secretary of this fund, the field of gas engineering has been very completely covered. The treatment is elementary owing to the fact that the questions and answers were written for a correspondence class.

In preparing the matter for publication in book form, the text has not been materially changed, which is regrettable, as the reader is disturbed by such phrases as "the members of the class." Other peculiarities of the catechism type of textbook are noticeable, but the book is so generally valuable, that they can well be overlooked.

The subject matter of the book is divided into eight (8) sections, supplemented by a very complete index and a table of contents.

Section I. tells what illuminating gas is, gives the chemical compositions of various gases and names the apparatus necessary for its manufacture. Section II. treats of the coals and oils required in the manufacture of illuminating gas and describes the compositions and requirements for successful use.

Section III., on Manufacturing Plant, Construction and Operation, is divided into three parts; Part 1 deals with coal gas, Part 2, with water gas, and Part 3 with that common to coal and water gas. The section is unusually complete as regards bench operations for coal gas and description of the apparatus necessary in both types of plant. The portion dealing with construction is not so complete; particularly lacking are any descriptions of the required proportions of the parts of a bench, such as the ratio of grate area to retort, or the volume of flue surface necessary, or in the case of Water Gas, the relation of grate area to checker brick, etc.

Section IV. deals with the Distribution System and Consumers' Appliances. This section is very complete, covering the mains, services, and appliance features, both in the field and office. The description of the appliances and methods are excellent. The section contains quite a complete set of sample forms, showing how records should be kept.

Sections V. and VI. treat mostly of the properties of the constituent gases entering into the compositions of illuminating gas, and of the determination and action of these constituents in the use of the gas. A sufficient number of problems are worked out to familiarize the student with the physical facts, of which he should have a knowledge.

Section VII. deals with Masonry Construction. Why this section has been included in a volume on gas engineering is hard to understand. That the subject of Building Construction should be treated in the Practical Class Course is not disputed, but that masonry should be treated to exclusion of the other important branches, is questionable. Considerable room is taken up in the discussion of the thickness of brick walls. This discussion is summed up with the statement that "in practice" this would be done differently, which really means that in most cities a building code exists, which must be followed. It is regrettable that since a section devoted to building construction was inserted some treatment of wood and steel roofs and floors was not included.

Section VIII. is given the inappropriate title, "Miscellaneous." It deals entirely with the treatment of persons overcome by gas, "First Aid for Persons Overcome by Gas" would have been a far preferable title.

The volume should be in the library of every gas engineer, as it is a veritable handbook of the elements of the profession.

*Engineer of Construction, Consolidated Gas Co., of New York, 4 Irving Pl., New York City.

THE DESIGN OF REINFORCED CONCRETE SLABS, BEAMS AND COLUMNS.—Conforming to the Recommendations of the Joint Committee on Concrete and Reinforced Concrete, Composed of Committees of the American Society of Civil Engineers, American Society for Testing Materials, American Railway Engineering and Maintenance of Way Association, Association of American Portland Cement Manufacturers. By H. B. Andrews, M. Am. Soc. C. E. Boston, Mass.: The Author (166 Devonshire St.). Stiff paper; 11¾ × 9 ins.; pp. 23; five charts and three text figures. $1.

Taking the well-known recommendations of the Joint Committee on Concrete and Reinforced Concrete as a basis for his computations, Mr. Andrews has prepared a set of diagrams for the standard design of slabs, T-beams and plain and reinforced-concrete columns under given variations of load. Accompanying the diagrams is the report of the Joint Committee, a number of formulas, and tables for sizes, weights, proportions and costs of the materials that go into reinforced concrete. The latter are of value to everyone; the tables are useful to those who wish to design according to the Joint Committee's recommendations.

STATISTIK.—Der an den höheren technischen Staats- und Kommunalschulen, sowie an den privaten Techniken, Polytechniken und Akademien gelehrten Disziplinen, sowie der für die einzelnen Unterrichtsfächer aufgewendeten Stundenzahlen. Second edition, revised. Issued by Georg Matthes, Direktor der Gewerbe-Akademie, Berlin. Berlin, Germany: Wilhelm Issleib. Paper; 7½ × 11 ins.; pp. 15; four folding sheets.

The present interest in the curricula of technical schools in the United States, which has led several societies to delegate committees to compare curricula with a view to improving engineering education, lends special value to the present pamphlet. The head of the Gewerbe-Akademie of Berlin, Germany, collected data as to the number of hours of instruction in all technical schools in Germany, and tabulated them for ready comparison, duly classified under the several subjects taught. The pamphlet gives the resulting tables, of which there are four, covering mechanical engineering, electrical engineering, architecture, and civil engineering. A note states, for each school, whether it is supported by state or city or privately. Comparison of these tables with similar ones for American technical schools should be interesting to educators.

MUNICIPAL TRADING (UNITED KINGDOM).—Returns. Parts I., II., III. and VI. London, England: Wyman & Sons, Ltd. Paper; 8½ × 13¼ ins.

Part 1.: Leeds, Sheffield, Bradford, Halifax and Huddersfield. Pp. 109. 11½d.; American price, 50 cts.

Part II.: Liverpool, Manchester, Salford, Bolton, Oldham, Blackburn, Preston, Birkenhead, Burnley, Stockport and Blackpool. Pp. 229. 1s. 11d.; American price, 80 cts.

Part III.: Birmingham, Nottingham, Leicester, Derby, Wolverhampton, Norwich, West Ham, East Ham, Croydon and Brighton. Pp. 197. 1s. 8d.; American price, 70 cts.

Part VI.: Edinburgh, Glasgow, Dundee and Aberdeen. Pp. 83. 8½d.; American price, 30 cts.

A large mass of statistics, mostly financial, regarding the results of municipal trading, or, as we should say, municipal ownership, in the larger municipalities of the United Kingdom are brought together in these reports. Other reports, which will follow, will complete the results of the statistical inquiry for all places of 90,000 population and upwards, and in addition for several somewhat smaller ones. The order requiring the return called for the following-described information:

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tishment or subsequent extension, how managed, capital employed and how obtained, value of the undertaking, capital paid off and outstanding, loan charges, provision for depreciation, gross income and expenditure, net profit or loss, how profit is allocated or loss met, amount of rates or burden to rates, number and salaries of the chief paid officials, number of work-people, rate of wages paid in chief classes of labor, and prices charged for products or services supplied or rendered.

The returns contain, as might be supposed, a large amount of detailed information of interest to students of the municipal ownership question.

Coke Ovens and By-Products.

Reviewed by CHARLES D. ROBISON.*

MODERN COKING PRACTICE.—Including the Analysis of Materials and Products. A Handbook for Those Engaged in Coke Manufacture and the Recovery of By-Products. By T. H. Byrom, F. I. S., F. C. S., Chief Chemist to The Wigan Coal & Iron Co., Author of the "Physics and Chemistry of Mining," and J. R. Christopher, Lecturer on Coke Manufacture at the Wigan Technical College. New York: The Norman W. Henley Publishing Co. London, England. Crosby Lockwood & Son. Cloth; 5⅝ × 9¼ ins.; pp. 156; 110 illustrations, partly in the text. $3.50, net.

This book is evidently designed to convey in a concise manner, to persons having practically no knowledge of the art, a general knowledge of the history and development of by-product coke-oven practice, and of the different processes involved in the recovery of by-products. It has the fault of many handbooks in that it attempts to cover too wide a field in too few pages.

Three chapters, comprising 31 pages, are devoted to a description of the flue and gas supply arrangements used by the Semet-Solvay horizontal flue type and by the Otto-Hoffman, Otto-Hilgenstock and four other types of vertical flue ovens. These chapters convey, in a general way, an idea of the different arrangements employed in the different types of ovens, but give no details in regard to construction, or estimates of cost, or results of operation that may be expected from the different ovens.

The remaining chapters, 14 in number, comprising 117 pages, are devoted to: A brief history of the iron and coke industry and of the development of the gas engine; an elementary treatise on the classification of fuels with particular reference to metallurgy; brief descriptions of six types of coal washers; method of sampling and determining calorific value of coal and coke; description of apparatus necessary for the recovery of by-products; description of apparatus necessary for the treatment of gas for the recovery of by-products; a description of the Beale type of gas exhauster; composition and analysis of ammoniacal liquor; working up of ammoniacal liquor, including a description of the apparatus required for concentrating ammonia and for the manufacture of sulphate of ammonia; treatment of waste gases from sulphate plants; method by which the value of ammonia sulphate can be determined; the recovery of ammonia direct from coke-oven gas; uses for surplus gas; description of apparatus for gas analysis; description of the junker's calorimeter and descriptions of electric pyrometers. All of these subjects are treated in such a general way that the information given has but little value for any purpose other than to call the attention of the reader to the different subjects that must be investigated in connection with by-product coke-oven operation.

The only chapter that is likely to contain information that will be new to any one whose business requires that he be familiar with this subject is the one on the recovery of ammonia direct from the gas, without the use of condensers or scrubbers, which is a new development in European practice and is but slightly known in this country.

The printing and paper used in the book are of unusually high grade and the cuts have been prepared with great care. It will prove of value to persons desiring to acquire a general knowledge of the subject, or to those investigating this matter for the first time, by indicating the different lines of investigation that should be taken up.

The term handbook seems to be a misnomer as there are few tables given; it is more nearly

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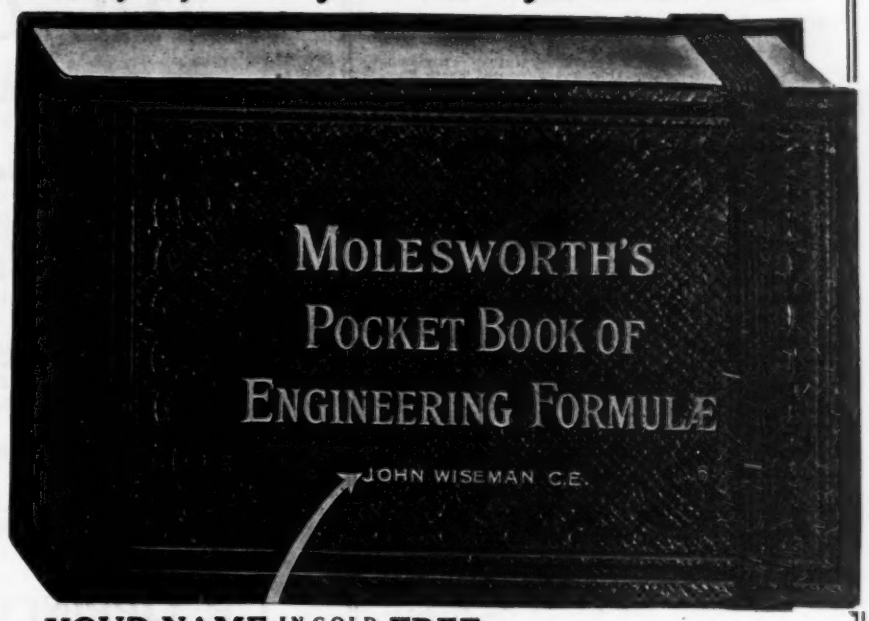

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The New York State Highway Law.

MASON ON HIGHWAYS.—Containing Highway Law. [New York State.] Being Chapter 25 of the Consolidated Laws, as Amended by the Laws of 1909, with All Constitutional and General Statutory Provisions Relating to Highways, Highway Officers, Their Powers and Duties. Annotated. By Herbert Delevan Mason, of the New York City Bar. Seventh edition, by Charles G. Blakeslee. Albany, N. Y.: Banks & Co. Cloth; 5⅝ x 9¼ ins.; pp. 235. $3.50, net.

It seems to be perfectly safe to say that the State of New York now has the most comprehensive and systematic highway law and highway administration system of any state in the Union. This was brought about by the consolidation in 1908 of all existing state highway legislation and by the creation of a State Highway Department and a general reform of highway administration as exercised by the state and by county and town officials. The volume before us contains the consolidation of the highway laws as effected in 1908 and as amended by the Legislature of 1909. The volume also contains many notes giving the results of court decisions bearing upon highway administration.

It appears that the first road legislation in New York State was passed in 1797, under the title "An Act to Regulate Highways." This act applied to all the state except the counties of New York, Suffolk, Queens and Kings. Up to 1873 all work on highways of the state outside of cities and villages was done by the day-labor system. In the year named it was made optional with several towns whether or not they should change from the day-labor to the money system.

This is not the place to outline the provisions of the New York State Highway Law, but it seems proper to state that the consolidated act of 1908 provides for a state commission of three members, one of whom "shall be a practical civil engineer who shall have had actual experience in the construction of highways and bridges." There are six division engineers acting under the commission. Each county and each town has a superintendent responsible primarily to the county and town governments, but the town superintendent is under the control of the county superintendent to a considerable degree, and both are more or less completely under the jurisdiction of the state commission.

The volume as a whole bids fair to be very useful to a large number of the residents and officials of New York State, and doubtless it will also be consulted with interest and profit by many in other parts of the country.

STATE COMMISSION OF HIGHWAYS (New York).—Report for the Year Ending Dec. 31, 1909. (S. Percy Hooker, Chairman.) Albany, N. Y.: Pub. Doc. Cloth; 5⅛ x 9 ins.; pp. 513; folding and other plates.

The operations of the New York State Highway Commission during the first year of its existence are reviewed briefly in the general report of the Commission. This review is followed by an interesting organization chart and by a number of appendixes giving the detailed reports of the First Deputy Commissioner, in charge of maintenance and repair of improved roads, and the Second Deputy, in charge of town roads. Other appendixes deal with expenditures; tests of stone, cement, sand, brick and bituminous material; moneys appropriated by the state and raised by the individual towns throughout the state for road work; work carried out under the direction of the State Highway Commission, and various other statistical and descriptive matter.

A traffic census report covers observations made on Sept. 1 and 15 and Oct. 1 and 15, 1909, on many roads in different parts of the state. The roads are given by numbers, only, and the observations are reported in the form of horse and motor "traffic units, multiplied by relative weights." The horse without vehicle was made the unit for horse traffic, and a "four-horse vehicle, heavy" was weighted at 6. A motor cycle was used as the unit in the motor vehicles, and the units were increased according to the number of passengers carried by motor cars up to seven. Freight trucks, omnibuses, etc., were reported as 10, a single traction engine as 15, and a two-traction engine as 30. The volume is particularly interesting because it marks the beginning of a new era in highway administration in the State of New York.

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The three volumes before us complete the encyclopedia, the first two volumes of which were noted in our issue of Nov. 15, 1906. As we then stated, the work appears to be wholly a British production, with nothing American about it except the imprint; and, as we also stated in our review of the earlier volumes, the classification and arrangement are somewhat peculiar. As to arrangement or classification, it may be noted that in one of the present volumes we find the entry, Meter, Electric, but no entry, Meter, Water. Looking under Water, we find an article Water Meter, and at the same time we notice that Water Softening has a separate article; whereas various types of water filters are treated under Water Supply, and there is no entry Water Purification. These are comparatively minor details, and yet they affect the ready use of any work of reference until the user becomes familiar with its idiosyncracies. As a whole, the encyclopedia appears to be serviceable for the British readers to whom it is more particularly addressed. Except for its British limitations, it promises to be useful in this country, also.

THE FEDERAL CORPORATION TAX AND MODERN ACCOUNTING PRACTICE.—A Paper by A. M. Sakolski (Statistician for Hay & Boynton, Members N. Y. Stock Exchange). (From the "Yale Review," February, 1910.) New Haven, Conn.: The Yale Publishing Association. Paper; 6 x 9¼ ins.; pp. 372 to 389.

Anomalies in the requirements of the Federal Corporation Tax Law of last year, due to ignorance or neglect of accounting practice on the part of the framers, are pointed out in this pamphlet. Some of the inconsistencies in the law, fortunately, are being lessened by the interpretation put upon the requirements of the law by those charged with its administration.

THE BOOK OF AMERICAN MUNICIPALITIES.—In Reference to What Is What in Our Cities. An Authentic Summary of Civic Progress and Achievements. Chicago, Ill.: Municipal Information Bureau. Stiff paper; 8 x 11¼ ins.; pp. 128. $3.50, net.

A considerable amount of useful information regarding some 80 cities is given in this volume. The information appears to have been prepared in most instances by some official connected with the city reported on. The information given is partly descriptive, partly statistical. The names and salaries of a number of officials are given for each city, and more or less information regarding the various city departments, public works, taxation debt and revenue, etc.

DEPARTMENT OF FINANCE AND MUNICIPAL ACCOUNTS (Iowa).—Second Annual Report of Auditor of State. Statistics of Cities and Towns of Iowa, 1908-9. (John L. Bleakly, Auditor of State.) Des Moines, Iowa: Pub. Doc. Cloth; 8¾ x 12 ins.; pp. 135.

A UNIFORM CLASSIFICATION OF MUNICIPAL RECEIPTS AND PAYMENTS.—Prescribed for the Cities and Towns of Massachusetts as a Basis for a Standard System of Accounts and Reports. Municipal Bulletin No. 1, Bureau of Statistics; Charles F. Gettemy, Director. Boston, Mass.: Pub. Doc. Paper; 6 x 9⅛ ins.; pp. 64; one folding sheet.

A considerable range of financial and physical statistics for 93 cities and 660 towns in Iowa is presented in the first-named volume. There is but little text, and that for the most part is explanatory of the tables. The text does, however, contain something in the way of summaries and comment, and the tables give grand totals. The first annual report of this department was noticed in our issue of June 17, 1909 (p. 74).

In the issue just named we also noticed the first report on "The Comparative Financial Statistics of the Cities and Towns of Massachusetts." Since that date Mr. Gettemy, Director of the Massachusetts Bureau of Statistics, has taken great pains to prepare the above-noted bulletin on the terminology and classification of financial statistics of cities. As far as possible, it appears to have been the object of Mr. Gettemy to conform his terminology and classification to that used by the U. S. Bureau of the Census, which in turn has been based largely on the work of a committee of the National Municipal League. Obviously, Mr. Gettemy has had to make various modifications to conform to Massachusetts law and practice. The bulletin is a notable illustration of the progress in securing uniform municipal accounts and statistics which is being made in the United States.

British Public Health and Social Conditions.

PUBLIC HEALTH AND SOCIAL CONDITIONS.—Statistical Memoranda and Charts Prepared in the Local Government Board Relating to Public Health and Social Conditions. London, England: Wyman & Sons, Ltd. Paper; 8¼ x 13¼ ins.; pp. 109; numerous folding plates. 5s.; American price, $2.

The statistics, legislation, and to some extent the public administration, of various matters affecting health and social conditions of the people of Great Britain are here reviewed for a period covering the last half century. No claim is made for original research, but the compilers have performed a very useful service in bringing together from census reports and the annual reports of the Registrars-General for England and Wales, Scotland and Ireland, a large amount of otherwise scattered information, and in accompanying it with brief interpretative comment. Numerous tables and diagrams are given. The growth of population, birth, marriage and mortality statistics, various industrial conditions, including fluctuations in wages and prices, methods of poor relief, and information on local taxation and debt, are given. In the section on mortality, the decline in deaths (and in a few cases increase) due to specific causes, more particularly to communicable diseases, is shown. The brief sections on public health and poor law, or charity, administration are interesting and suggestive.

This is not the place to go into the statistics given in the report, but we cannot refrain from noting that the death rate for England and Wales declined from 22.7 per 1,000 population for the half decade 1851-5 to 16 for 1901-5, and to 15 for the year 1907. Nor can we refrain from adding that, to the shame of the United States, it is impossible to state with accuracy not only what the death rate has been through so long a period of years, but also what it is now for the country at large. Some day the whole of the country will have sufficiently reliable mortality statistics to warrant the inclusion of all of the states in the registration area of the U. S. Bureau of the Census, but at present a bare quarter of the states are so included, and of the dozen or so falling in that category a number have been added to the list within the last two or three years.

THE HOUSE-FLY AT THE BAR.—New York: The Merchants' Association of New York. (S. C. Mead, Secy.). Stiff paper; 8¼ x 11¾ ins.; pp. 48; folding and other plates.

To the earlier pamphlet on the "Pollution of New York Harbor as a Menace to Health by the Dissemination of Intestinal Diseases through the Agencies of the Common House-Fly," published late in 1907, the Merchants' Association of New York added in 1909 a general study of the house-fly in its relation to typhoid fever and some other communicable diseases. The present pamphlet contains brief statements made on request by a large number of state and local health officers who were asked by the committee of the association to give their opinion as to the relative importance of flies, water and milk as disseminators of typhoid. Many who responded to the request lay heavy stress upon flies as a vehicle for communicating typhoid, but few seem to rank them as of anything like as great importance as water. Various articles on flies and food infection are reprinted toward the end of the pamphlet.

SOME PLANS AND SUGGESTIONS FOR HOUSING CONSUMPTIVES.—New York: The National Association for the Study and Prevention of Tuberculosis (105 East 22d St.; Dr. Livingston Farrand, Executive Secretary). Paper; 6¾ x 10¼ ins.; pp. 87; 95 text illustrations and 1 plate.

There is here brought together in small space a large amount of valuable information regarding the housing of consumptives. The pamphlet begins with the grouping of sanatorium buildings, then takes up administration buildings, and the latter combined with patients' quarters. There are then considered various types of patients' quarters, including the lean-to and cottage types, and infirmaries and buildings for advanced cases. There are also sections on farm-houses remodeled for housing consumptives, on day camps, and on sleeping porches for home treatment. The pamphlet is said to be preliminary to a more extensive treatment of the whole subject.

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Turnouts.

MODERN LOCATION OF STANDARD TURNOUTS.—A Manual of Practice. A Practical Treatment of the Various Problems Connected with Track Engineering. By C. M. Kurtz, of the Construction Department, Southern Pacific Co. San Francisco, Cal.: The Author (234 Iowa St.). Flexible leather; 4 × 6¾ ins.; pp. 51; 22 illustrations in the text. $1.25.

This is a novelty whose value all locating engineers will appreciate. Mr. Kurtz's original treatment of railway turnouts fills a gap in the literature of location. He considers only that part of the turnout which lies beyond the frog, and is not concerned with the lead—contrary to the common field-book treatment. The chief part of the turnout problem is to coordinate the turnout with its branch line, or rather with the P. I. of main and branch and the angle between the two. The solution is obtained when the frog (of known number or angle) is located in reference to the P. I., without regard to the distance from frog back to switch-point.

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The author recommends generally inserting a short length of tangent beyond the frog, before beginning the branch curve. The frog itself being straight, it is in any case necessary to start the curve calculations at the heel of the frog instead of at the point, and if there must be a piece of tangent in the curve it is better to make it of some length, partly for the same reasons that lead to using a tangent between the two halves of a reverse curve. The author recommends a "frog tangent" at least 30 ft. long, but his tables cover tangents of lengths 10 to 40 ft. (from actual frog point, or somewhat more from theoretical frog point).

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An auxiliary table for crossovers will also be found useful. For each frog number and each of four track spacings (12 to 18 ft.) this gives the true lengths and projections on main track of the distance between frog points and the distance between P. I.'s.

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AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—Proceedings of the Annual Convention held at Jacksonville, Fla., Oct. 19-21, 1909. (W. M. Camp, Editor, 1305 Manhattan Building, Chicago, Ill.) Paper; 6 x 9 ins.; pp. 340; illustrated.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.—Standard Code of Rules, Interurban Operation; also, Standard Code of Rules, City Operation. Adopted by the Transportation and Traffic Association at the 1909 Convention, Denver, Colo., Approved by the American Street and Interurban Railway Association. New York: The Association. (29 West 39th St.). Paper; 3½ x 6 ins.; pp. 99 and 44; illustrations in former.

AMERICAN WATER WORKS ASSOCIATION.—Proceedings of the Annual Convention held at Milwaukee, Wis., June 7-12, 1909. Published by the Secretary (J. M. Diven, 14 George St., Charleston, S. C.). Cloth; 6 x 9¼ ins.; pp. 796; numerous folding plates and text illustrations.

BOARD OF RAILROAD COMMISSIONERS (Massachusetts).—Annual Report, January, 1910. (Walter Perley Hall, Fitchburg, Mass., Chairman.) Boston, Mass.; Pub. Doc. (No 14). Cloth; 5¼ x 9 ins.; pp. xxxvi. + 337; two folding maps.

BULLETINS, U. S. GEOLOGICAL SURVEY.—George Otis Smith, Director. Washington, D. C.: Pub. Doc. Paper; 6 x 9¼ ins.

No. 400: Iron Ores, Fuels and Fluxes of the Birmingham District, Alabama. By Ernest F. Burchard and Charles Butts. With Chapters on the Origin of the Ores, by Edwin C. Eckel. Pp. 204; 17 plates (1 in pocket) and 19 text figures.

No. 408: A Reconnaissance of Some Mining Camps in Elko, Lander and Eureka Counties, Nevada. By William H. Emmons. Pp. 130; 5 plates (1 in pocket) and 22 text figures.

No. 411: Results of Spirit Leveling in Ohio, 1898 to 1908, inclusive. Compiled by S. S. Gannett and D. H. Baldwin. Work done in cooperation with the State of Ohio during 1901 to 1908, inclusive. Pp. 147.

No. 418: The Fire Tax and Waste of Structural Materials in the United States. By Herbert M. Wilson and John L. Cochrane. Pp. 30; 13 tables.

BUSINESS METHODS OF NEW YORK CITY'S POLICE DEPARTMENT.—Critical Study and Constructive Suggestions Pertaining to Administrative and Accounting Methods of the Bureau of Repairs and Supplies. Based upon inquiry requested by Police Commissioner Bingham, July, 1908, and pursued from August, 1908, to April, 1909, with the cooperation of William F. Baker, now Police Commissioner and then First Deputy. New York: Bureau of Municipal Research. Paper; 6 x 9 ins.; pp. 212; folding charts and tables. $1.

THE CHEMISTRY OF CYANIDE SOLUTIONS.—Resulting from the Treatment of Ores. By J. E. Clennell, Associate of the Institution of Mining and Metallurgy, etc., Author of "Analytical Work in Connection with the Cyanide Process." Second edition, corrected and enlarged. New York: McGraw-Hill Book Co. Cloth; 6 x 9½ ins.; pp. 202. $2.50, net.

COMMISSION GOVERNMENT IN AMERICAN CITIES.—By Ernest S. Bradford, Washington, D. C., Post-Graduate Department, University of Pennsylvania. (An address before the National Municipal League at Cincinnati, Ohio, Nov. 20, 1909.) Washington, D. C.: The Author (3025 Fifteenth St., N. W.). Paper; 6 x 9 ins.; pp. 217 to 228. 8 cts.

THE CORROSION OF IRON AND STEEL.—By Alfred Sang. New York: McGraw-Hill Book Co. Cloth; 5 x 7½ ins.; pp. 141. $1, net.

COTTON MILLS OF ALABAMA AND GEORGIA.—(Map.) Compiled and drawn by H. E. Anschutz, Civil Engineer, Montgomery, Ala.; The Author (P. O. Box 150). Map 20 x 30 ins., folded in leatherette binding 3¾ x 6 ins. $1.

DIE EISENBETONKUPPEL DER FRIEDRICHSTRASSENPASSAGE IN BERLIN.—By Siegmund Müller, Professor in the Technical College at Berlin. (Abstracted from "Armierter Beton," 1909, Heft 3-6.) Berlin, Germany: Julius Springer. Paper; 7½ x 10½ ins.; pp. 24; 28 illustrations in the text. 80 pfennigs; American price, 40 cts.

ENGINEERING SOCIETY OF WISCONSIN.—Proceedings of the First Annual Meeting, Held at Madison, Wis., Feb. 24-26, 1909. Madison, Wis.: The Society (W. G. Kirchoffer, Secy.). Paper; 6 x 9 ins.; pp. 167; text illustrations. 50 cts.

EXPORTERS' ENCYCLOPAEDIA.—Sixth (1910) edition. Containing full and authentic information relative to shipments for every country in the world. New York: Exporters' Encyclopaedia Co. Cloth; 5½ x 8¼ ins.; pp. 776. $5 (including monthly supplementary matter).

FOREST PRODUCTS OF THE UNITED STATES, 1908.—Forest Products, No. 10, Bureau of the Census; E. Dana Durand, Director. Compiled in Cooperation with the Department of Agriculture; Forest Service, Gifford Pinchot, Forester. Washington, D. C.: Pub. Doc. Paper; 5¾ x 9¼ ins.; pp. 137.

GEOLOGIC ATLAS OF THE UNITED STATES.—U. S. Geological Survey, George Otis Smith, Director. No. 169: Watkins Glen—Catatonk Folio. New York. By Henry S. Williams, Ralph S. Tarr and Edward M. Kindle. Washington, D. C.: Pub. Doc. Stiff paper; 18½ x 21¾ ins.; pp. 33; 8 plates and 13 text figures.

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MACHINES MARINES.—By P. Dromne. (Part of "Encyclopédie Scientifique," published under the direction of Dr. Toulouse.) Paris, France: Octave Doin & Fils. Cloth; 4¾ × 7¼ ins.; pp. 383; 137 illustrations in the text. 5 francs; American price, $1.50.

MINERAL RESOURCES OF THE UNITED STATES.—Calendar Year 1908. U. S. Geological Survey, George Otis Smith, Director. In two parts. Part I.: Metallic Products. Part II.: Nonmetallic Products. Washington, D. C.; Pub. Doc. Cloth; 5¾ × 9¼ ins.; pp. 816 and 899; two plates (in pocket) and three text illustrations in Part I.; one plate (in pocket) and six text illustrations in Part II.

MOSQUITO OR MAN?—The Conquest of the Tropical World. By Sir Rubert W. Boyce, Holt Professor of Pathology, University of Liverpool, Dean of the Liverpool School of Tropical Medicine, etc. New York: E. P. Dutton & Co. Cloth; 6 × 9 ins.; pp. 267; 34 plates. $3.50, net.

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NATAL GOVERNMENT RAILWAYS AND HARBOUR ENQUIRY BOARD.—Report, August, 1909. (Wm. Way, Secy.) Pietermaritzburg, Natal: Pub. Doc. Paper; 8¼ × 13 ins.; pp. 70; one folding plate.

THE NATIONAL CIVIC FEDERATION.—Annual Meeting, Nov. 22-23, 1909. President Seth Low's Annual Report—Workmen's Insurance in Foreign Countries—Employers' Liability in the United States—Compensation for Injured Wage Earners—The Prevention of Industrial Accidents—Employers' Voluntary Relief Associations—Retirement Funds or Old Age Pensions—Report on Work of Welfare Department—Annual Reports of Woman's Department. New York: The Federation (1 Madison Ave.; D. L. Cease, Secy.). Paper; 5½ × 7¾ ins.; pp. xviii. + 347; illustrations.

NEW JERSEY SANITARY ASSOCIATION.—Proceedings of the Annual Meeting held Dec. 3-4, 1909, at Lakewood, N. J. (James A. Exton, M. D., Arlington, Secy.) Paper; 5¾ × 9 ins.; pp. 98.

NOTES ON GOING VALUE AND METHOD FOR ITS COMPUTATION.—(With Discussion.) By John W. Alvord, Consulting Engineer. Papers on Valuation, American Water Works Association. (Read at the Milwaukee Convention, June, 1909; reprinted from the Proceedings of the American Water Works Association, 1909.) Paper; 6 × 9 ins.; pp. 184 to 279; folding plates and text illustrations.

PATTERN-MAKING.—By G. H. Willard. To Which Are Added Chapters on Core-Making and Molding, by F. D. Crawshaw, Assistant Dean, College of Engineering, University of Illinois. Chicago, Ill.: Popular Mechanics Co. Cloth; 5¼ × 8¼ ins.; pp. 214; 27 plates, containing 312 illustrations. $1.

PHYSIOGRAPHY OF THE ST. LOUIS AREA.—By N. M. Fenneman. Bulletin No. 12, Illinois State Geological Survey. Urbana, Ill.: University of Illinois. Cloth; 5¾ × 9¼ ins.; pp. 83; 18 plates (1 in pocket) and 10 text figures.

A PRACTICAL MANUAL ON SEA WATER DISTILLATION.—With a Description of the Necessary Machinery for the Process. By Frank Normandy, of the Middle Temple, Barrister-at-Law. London, England: Charles Griffin & Co., Ltd. Philadelphia, Pa.: J. B. Lippincott Co. Cloth; 5¼ × 8 ins.; pp. 244; 25 text illustrations and 16 tables. $2, net.

PRACTICAL TALKS ON CONTRACTING.—Being Reprints from "The Contractor" of Valuable Papers by Frank B. Gilbreth, C. A. Worden, A. O. Davidson and E. S. Hanson. Chicago, Ill.: The Contractor Publishing Co. Cloth; 5½ × 8¾ ins.; pp. 128; text illustrations. $1.50.

PROVINCIAL BOARD OF HEALTH OF ONTARIO, CANADA.—Annual Report, 1908. (Charles Alfred Hodgetts, M. D., Secy.) Toronto, Ont.: Pub. Doc. Paper; 6¼ × 9½ ins.; pp. 116; numerous plates.

TESTS OF TWO TYPES OF TILE-PROOF FURNACES UNDER A WATER-TUBE BOILER.—By J. M. Snodgrass. Bulletin No. 34, University of Illinois Engineering Experiment Station. Urbana, Ill.: The University. Paper; 6 × 9 ins.; pp. 20; eight illustrations in the text.

THE THEORY AND PRACTICE OF MODERN FRAMED STRUCTURES.—Designed for the Use of Schools and for Engineers in Professional Practice. By The Late J. B. Johnson, C. W. Bryan, Manager of The American Bridge Co., and F. E. Turneaure, Dean of the College of Mechanics and Engineering, University of Wisconsin. In Three Parts. Part I.: Stresses in Simple Structure. 9th edition, rewritten. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Cloth; 6 × 9¼ ins.; pp. 328; numerous illustrations in the text. $3, net.

THE UTILITY OF ALL KINDS OF HIGHER SCHOOLING.—An Investigation by R. T. Crane. Cloth; 5¼ × 8¼ ins.; pp. 331. $1, net.

WORKMEN'S INSURANCE AND BENEFIT FUNDS IN THE UNITED STATES.—Annual Report of the Commissioner of Labor, 1908. (Charles P. Neill, Commissioner.) Washington, D. C.: Pub. Doc. Cloth; 5¾ × 9¼ ins.; pp. 810.

WROUGHT-PIPE DRAINAGE SYSTEMS.—By J. J. Cosgrove, Author of "Principles and Practice of Plumbing," etc. Pittsburg, Pa.: Standard Sanitary Mfg. Co. Cloth; 5½ × 8½ ins.; pp. 145; 137 illustrations in the text. $2.

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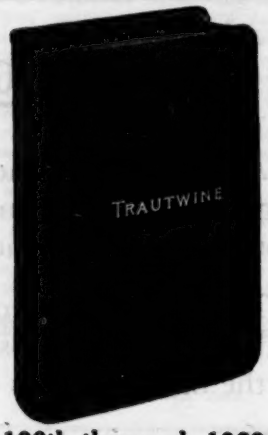

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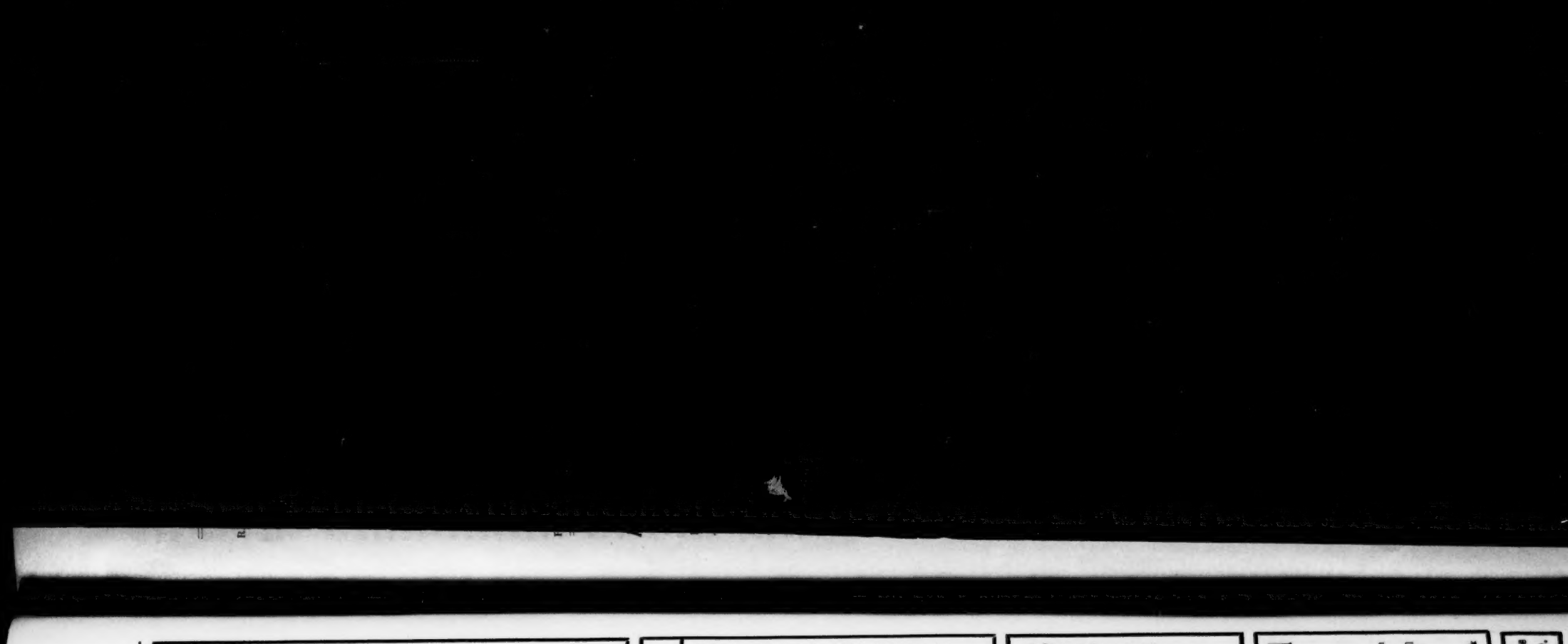
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